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Publication No. 249
Zoölogical Series Vol. XV

THE MARINE FISHES OF PANAMA

BY
Seth E. Meek
Late Assistant Curator, Department of Zoölogy
AND
Samuel F. Hildebrand
U. S. Bureau of Fisheries

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PART III

Wilfred H. Osgood
Curator, Department of Zoölogy
EDITOR

Chicago, U. S. A.
September 1, 1928

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VOLUME XV

PART III

CHICAGO, U. S. A.
1928

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CONTENTS OF PART III

Page
Contents of Part III XXV
List of Plates in Part III XXIX
List of new Genera and Species in Part III . . . XXXI
Index to Parts I-III 1019

Classes, Orders, Families, and Genera included in Part III

Page

Class III. Teleostomi —Continued.

Order XIV. Acanthopteri —Continued

Family LXI. Labridæ

The Wrasses

187. **Bodianus** Bloch........... 710
188. **Halichœres** Rüppell....... 714
189. **Pseudojulis** Bleeker........ 725
190. **Thalassoma** Swainson...... 726
191. **Xyrichthys** Cuvier......... 729
192. **Doratonotus** Günther...... 730

Family LXII. Scaridæ

The Parrot-fishes

193. **Cryptotomus** Cope......... 733
194. **Scarus** Forskål............ 735
195. **Pseudoscarus** Bleeker...... 744
196. **Sparisoma** Swainson....... 747

Family LXIII. Ephippidæ

The Spade-fishes

197. **Chætodipterus** Lacépède... 760
198. **Parapsettus** Steindachner... 763

Family LXIV. Chætodontidæ

The Butterfly-fishes

199. **Chætodon** Linnæus......... 765
200. **Pomacanthus** Lacépède.... 772
201. **Holacanthus** Lacépède..... 777

Page

Family LXV. Acanthuridæ

Surgeon-fishes

202. **Acanthurus** Forskål........ 781
203. **Xesurus** Jord. & Everm.... 786

Family LXVI. Balistidæ

The Trigger-fishes

204. **Balistes** Linnæus.......... 787
205. **Canthidermis** Swainson.... 793

Family LXVII. Monacanthidæ

The File-fishes

206. **Monacanthus** Oken........ 796
207. **Cantherines** Swainson..... 800
208. **Alutera** Oken............. 801

Family LXVIII. Ostraciidæ

The Trunk-fishes

209. **Lactophrys** Swainson...... 804

Family LXIX. Tetraodontidæ

The Puffers

210. **Lagocephalus** Swainson.... 809
211. **Sphœroides** Duméril....... 811
212. **Guentheridia** Gilb. & Starks 821
213. **Tetraodon** Linnæus........ 822
214. **Canthigaster** Swainson..... 825

Family LXX. Diodontidæ

The Porcupine-fishes

215. **Diodon** Linnæus........... 826
216. **Chilomycterus** Bibron...... 831

771505

Page

Family LXXI. Scorpænidæ

THE ROCK-FISHES

217. **Scorpæna** Linnæus 833
218. **Scorpænodes** Linnæus 845

Family LXXII. Triglidæ

THE GURNARDS

219. **Prionotus** Lacépède 848

Family LXXIII. Cephalacanthidæ

THE FLYING GURNARDS

220. **Cephalacanthus** Lacépède . . 859

Family LXXIV. Gobiidæ

THE GOBIES

221. **Gymneleotris** Bleeker 863
222. **Erotelis** Poey 864
223. **Lophogobius** Gill 866
224. **Bathygobius** Bleeker 867
225. **Tyntlastes** Günther 869
226. **Evorthodus** Gill 869
227. **Microgobius** Poey 871
228. **Euctenogobius** Gill 874
229. **Gobionellus** Girard 876
230. **Bollmannia** Jordan 885
231. **Aboma** Jordan & Starks 887
232. **Enypnias** Jord. & Everm 887
233. **Gerhardinus** gen. nov 889
234. **Garmannia** Jordan 889
235. **Gobiosoma** Girard 891
236. **Evermannia** Jordan 891
237. **Gobioides** Lacépède 894

Family LXXV. Echeneididæ

THE REMORAS

238. **Phtheirichthys** Gill 895
239. **Echeneis** Linnæus 896
240. **Remora** Gill 897

Family LXXVI. Opisthognathidæ

THE JAW-FISHES

241. **Opisthognathus** Cuvier 900

Family LXXVII. Dactyloscopidæ

THE SAND STAR-GAZERS

242. **Dactyloscopus** Gill 902
243. **Dactylagnus** Gill 904
244. **Cokeridia** gen. nov 905

Page

Family LXXVIII. Uranoscopidæ

THE STAR-GAZERS

245. **Astroscopus** Brevoort 907
246. **Kathetostoma** Günther 909

Family LXXIX. Batrachoididæ

THE TOAD-FISHES

247. **Batrachoides** Lacépède 911
248. **Opsanus** Rafinesque 917
249. **Amphichthys** Swainson 918
250. **Thalassophryne** Günther . . . 919
251. **Porichthys** Girard 922

Family LXXX. Gobiesocidæ

THE CLING-FISHES

252. **Gobiesox** Lacépède 925
253. **Arbaciosa** Jord. & Everm . . . 926

Family LXXXI. Blenniidæ

THE BLENNIES

254. **Auchenopterus** Günther 930
255. **Mnierpes** Jord. & Everm 933
256. **Dialommus** Gilbert 934
257. **Labrisomus** Swainson 935
258. **Malacoctenus** Gill 938
259. **Blennius** Linnæus 940
260. **Hypsoblennius** Gill 942
261. **Homesthes** Gilbert 947
262. **Rupiscartes** Swainson 948
263. **Salarichthys** Guichenot 949
264. **Salarias** Cuvier 951
265. **Emblemaria** Jord. & Gilb . . . 952

Family LXXXII. Cerdalidæ

266. **Microdesmus** Günther 954
267. **Cerdale** Jord. & Gilb 958

Family LXXXIII. Ophidiidæ

THE CUSK EELS

268. **Lepophidium** Gill 960
269. **Otophidium** Gill 961

Family LXXXIV. Carapidæ

THE PEARL-FISHES

270. **Carapus** Rafinesque 963
271. **Leptofierasfer** gen. nov 964

Family LXXXV. Brotulidæ

Page
272. **Ogilbia** Jord. & Everm..... 965
273. **Pseudobythites** gen. nov.... 968

Family LXXXVI. Bregmacerotidæ

274. **Bregmaceros** Thompson.... 969

Family LXXXVII. Pleuronectidæ

THE FLOUNDERS

275. **Pseudorhombus** Bleeker.... 971
276. **Hippoglossina** Steind....... 973
277. **Paralichthys** Girard....... 974
278. **Engyophrys** Jord. & Bollm.. 975
279. **Platophrys** Swainson....... 977
280. **Syacium** Ranzani......... 980
281. **Citharichthys** Bleeker...... 985
282. **Azevia** Jordan............ 990
283. **Cyclopsetta** Gill........... 991
284. **Etropus** Jord. & Gilb....... 992

Family LXXXVIII. Soleidæ

THE SOLES

Page
285. **Achirus** Lacépède......... 994
286. **Apionichthys** Kaup........ 1003
287. **Symphurus** Rafinesque..... 1004

Order XV. Pediculati

Family LXXXIX. Antennariidæ

THE FROG-FISHES

288. **Histrio** Fischer............ 1010
289. **Antennarius** Commerson... 1011

Family XC. Ogcocephalidæ

THE BAT-FISHES

290. **Ogcocephalus** Fischer...... 1016
291. **Zalieutes** Jord. & Everm.... 1018

LIST OF PLATES IN PART III

Opposite Page

LXXII. Fig. 1. **Scarus azureus** sp. nov.
Fig. 2. **Scarus nigrescens** sp. nov. 742
LXXIII. Fig. 1. **Sparisoma radians** (Cuvier & Valenciennes), male.
Fig. 2. **Sparisoma radians** (Cuvier & Valenciennes), female 750
LXXIV. Fig. 1. **Sparisoma rhomaleum** sp. nov.
Fig. 2. **Sparisoma elongatum** sp. nov....... 754
LXXV. **Chætodipterus faber** (Broussonet) 760
LXXVI. **Chætodipterus zonatus** (Girard) 762
LXXVII. **Sphœroides marmoratus** (Ranzani) (a) Dorsal outline 812
LXXVIII. Fig. 1. **Sphœroides annulatus** (Jenyns).
Fig. 2. **Sphœroides testudineus** (Linnæus). 816
LXXIX. **Sphœroides kendalli** sp. nov.................. 818
LXXX. **Scorpæna isthmensis** sp. nov............... 842
LXXXI. Fig. 1. **Scorpæna colonensis** sp. nov.
Fig. 2. **Scorpænodes xyris** (Jordan & Gilbert) 844
LXXXII. **Scorpænodes caribbæus** sp. nov.............. 846
LXXXIII. **Prionotus aspersus** sp. nov.................. 856
LXXXIV. **Evorthodus minutus** sp. nov................ 872
LXXXV. **Microgobius tabogensis** sp. nov............. 872
LXXXVI. **Euctenogobius panamensis** sp. nov.......... 876
LXXXVII. **Euctenogobius liolepis** sp. nov.............. 876
LXXXVIII. **Gerhardinus nudus** sp. nov 888
LXXXIX. **Cokeridia crossota** gen. et sp. nov 904
XC. **Batrachoides gilberti** sp. nov 912
XCI. **Opsanus barbatus** sp. nov 916
XCII. **Arbaciosa minuta** sp. nov. (a) Ventral outline 928
XCIII. Fig. 1. **Auchenopterus affinis** (Steindacher).
Fig. 2. **Auchenopterus monophthalmus** Günther 932
XCIV. Fig. 1. **Labrisomus nuchipinnis** (Quoy & Gaimard).
Fig. 2. **Labrisomus xanti** Gill.............. 936
XCV. Fig. 1. **Malacoctenus delalandii** (Cuvier & Valenciennes).

		Opposite Page
	Fig. 2. **Malacoctenus zonifer** (Jordan & Gilbert)	938
XCVI.	Fig. 1. **Hypsoblennius minutus** sp. nov.	
	Fig. 2. **Hypsoblennius lignus** sp. nov.	944
XCVII.	**Emblemaria nigra** sp. nov.	954
XCVIII.	Fig. 1. **Microdesmus affinis** sp. nov.	
	Fig. 2. **Microdesmus intermedius** sp. nov.	
	Fig. 3. **Microdesmus multiradiatus** sp. nov.	954
XCIX.	Fig. 1. **Leptofierasfer macrurus** gen. et sp. nov.	
	Fig. 2. **Pseudobythites sanguineus** gen. et sp. nov.	964
C.	**Citharichthys evermanni** sp. nov.	988
CI.	Fig. 1. **Achirus lineatus** (Linnæus).	
	Fig. 2. **Achirus mazatlanus** (Steindachner)	998
CII.	Fig. 1. **Achirus fimbriatus** (Günther).	
	Fig. 2. **Achirus fluviatilis** sp. nov	1000

LIST OF NEW GENERA AND SPECIES IN PART III

NEW GENERA

	Page
Gerhardinus	889
Cokeridia	905
Leptofierasfer	964
Pseudobythites	968

NEW SPECIES

Scarus azureus	742
Scarus nigrescens	743
Sparisoma rhomaleum	754
Sparisoma elongatum	757
Sphœroides kendalli	819
Scorpæna isthmensis	842
Scorpæna colonensis	844
Scorpænodes caribbæus	847
Prionotus aspersus	856
Evorthodus minutus	870
Microgobius tabogensis	873
Euctenogobius panamensis	874
Euctenogobius liolepis	875
Gerhardinus nudus	889
Cokeridia crossota	906
Batrachoides gilberti	914
Opsanus barbatus	917
Arbaciosa minuta	928
Hypsoblennius minutus	943
Hypsoblennius lignus	946
Emblemaria nigra	953
Microdesmus affinis	955
Microdesmus intermedius	957
Microdesmus multiradiatus	958
Leptofierasfer macrurus	964
Pseudobythites sanguineus	968
Citharichthys evermanni	989
Achirus fluviatilis	1002

THE MARINE FISHES OF PANAMA.

BY SETH E. MEEK AND SAMUEL F. HILDEBRAND.

PART III.

Class III. Teleostomi—Continued.

Order XIV. Acanthopteri—Continued.

Family LXI. **Labridæ.**

THE WRASSES.

Body oblong or elongate; mouth moderate, terminal; lips thick, the lower one usually with a lateral flap; premaxillaries protractile; maxillary without a supplemental bone, slipping under preorbital; nostrils round, with 2 openings on each side; teeth in the jaws strong, separate or more or less coalescent at base, never forming a continuous plate; the anterior teeth usually canine-like; no teeth on vomer or palatines; lower pharyngeals completely united into one bone, the teeth conical or tubercular; branchiostegals 5 or 6; pseudobranchiæ well developed; gills 3½, the slit behind the last arch small or obsolete; gill-membranes somewhat connected, sometimes joined to the isthmus; scales large, cycloid; lateral line continuous or interrupted, often abruptly bent; dorsal fin continuous, its spines slender, 3 to 20 in number; anal similar to soft portion of dorsal, with 2 to 6 spines; ventrals thoracic, inserted below pectorals, with I, 5 rays; air bladder present; no pyloric cæca.

KEY TO THE GENERA.*

a. Dorsal spines 12; lateral line complete and continuous, without abrupt curve. *Bodianus*, p. 710.

aa. Dorsal spines 8 or 9; lateral line either curved abruptly downward or interrupted posteriorly.

b. Cheeks and opercles entirely scaleless; lateral line not interrupted, but with an abrupt downward curve posteriorly.

c. Dorsal spines constantly 9.

---

*Since these pages were prepared, Henry W. Fowler (Proc. Ac. Nat. Sci. Phila., 1917, p. 133) has recorded a genus and species, *Lachnolaimus maximus* (Walbaum) from Colon, not obtained by us.

d. Upper jaw with a well developed canine tooth posteriorly on each side, near angle of mouth; anteriorly with 2 canines; lower jaw with 4 canines. *Halichœres,* p. 714.

dd. Posterior canines wanting; upper jaw anteriorly with 2 canines; lower jaw with 2 to 4 canines. *Pseudojulis,* p. 725.

cc. Dorsal spines constantly 8; no posterior canines. *Thalassoma,* p. 726.

bb. Cheeks and opercles scaly, at least under and back of eyes; lateral line interrupted posteriorly, reappearing on middle of caudal peduncle.

e. Head short and deep, its anterior profile nearly vertical in adult, compressed into a sharp edge; preorbital extremely deep; snout little in advance of forehead; dorsal fin continuous, the spines graduated, nearly of equal length. *Xyrichthys,* p. 729.

ee. Head rather long and low, its anterior profile not steep, straight or concave, not compressed into a sharp edge; preorbital rather narrow; snout long and sharply pointed; anterior spines of dorsal elevated, longer than the succeeding ones, making the margin of the fin concave. *Doratonotus,* p. 730.

187. Genus **Bodianus** Bloch.

Bodianus Bloch, Naturg. Ausl. Fische, IV, 1790, 48 (type *Bodianus bodianus* Bloch).

Harpe Lacépède, Hist. Nat. Poiss., IV, 1803, 426, Pl. VIII, fig. 2 (type *Harpe cœruleoaureus* Lacépède).

Cossyphus Cuvier & Valenciennes, Hist. Nat. Poiss., XIII, 1839, 102 (type *Bodianus bodianus* Bloch; name preoccupied).

Body rather robust, moderately compressed; the back moderately elevated; head pointed in young, becoming more and more blunt with age, large scales with a prominent fleshy pad on forehead; mouth rather large; jaws about equal; teeth strong; each jaw anteriorly with 4 canines; upper jaw posteriorly with a single pair of canines; other teeth short, coalescent at base; lateral line complete and continuous; scales large, little reduced on chest, extending up on base of soft rays of dorsal and anal and forming a sheath; cheek, opercle and preopercle scaly; dorsal with 12 low spines, the median soft rays produced in adult; caudal truncate in young, concave in adult with the outer rays produced; anal with 3 rather strong spines, the soft portion similar to that of dorsal; ventrals inserted below base of pectorals; vertebræ $11 + 17 = 28$.

KEY TO THE SPECIES.

a. Dorsal profile of head straight or slightly convex at all ages, never concave; gill-rakers 10 or 11 on lower limb of first arch; sides without black bands or yellow bar; tip of pectorals pale. *rufus,* p. 711.

aa. Dorsal profile of head more or less concave, except in very young; large males with a prominent fleshy pad on forehead; gill-rakers 12 or 13 on lower limb of first arch; sides in female with 2 distinct, black, longitudinal bands; male with a yellow vertical bar on sides passing over abdomen just in front of vent; tip of pectorals black. *diplotænia,* p. 712.

516. Bodianus rufus (Linnæus).

Labrus rufus Linnæus, Syst. Nat., Ed. X, 1758, 284 (America).

Perro colorado Parra, Desc. Piezas de Hist. Nat., 1787, 3, Pl. III, fig. 1 (Havana).

Bodianus bodianus Bloch, Naturg. Ausl. Fische, IV, 1790, 33, Pl. CCXXIII (Brazil; after a drawing by Prince Maurice).

Lutjanus verres Bloch, Naturg. Ausl. Fische, V, 1791, 9, Pl. CCLV (locality unknown).

Sparus falcatus Bloch, Naturg. Ausl. Fische, V, 1791, 20, Pl. CCLVIII (after a drawing by Plumier made at Martinique).

Labrus semiruber Lacépède, Hist. Nat. Poiss., III, 1802, 428 (Rio de Janeiro; from notes by Commerson).

Bodianus blochii Lacépède, Hist. Nat. Poiss., IV, 1803, 279 (after *Bodianus bodianus* Bloch).

Harpe cærulea-aureus Lacépède, Hist. Nat. Poiss., IV, 1803, 426 & 427, Pl. VIII, fig. 2 (Martinique; from the drawing of Plumier used by Bloch).

Cossyphus bodianus Cuvier & Valenciennes, Hist. Nat. Poiss., XIII, 1839, 103.

Cossyphus verres Castelnau, Anim. Nouv. Rares Amér. Sud., 1855, 27.

Cossyphus rufus Günther, Cat. Fish. Brit. Mus., IV, 1862, 108.

Harpe rufus Gill, Proc. Ac. Nat. Sci. Phila., 1863, 222.

Bodianus rufus Poey, Repertorio, II, 1868, 331.

Harpe rufa Jordan, Rept. U. S. Fish Comm., XV, 1887 (1891), 629; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1583.

Head 3.1 to 3.5; depth 2.85 to 3.43; D. XII, 10 or 11; A. III, 11 to 13; scales 33 to 35.

Body elongate, compressed; dorsal profile anteriorly nearly straight or slightly convex, not concave over snout; head rather strongly compressed; snout sharply pointed, its length 2.38 to 2.94 in head; eye 4.8 to 6.4; mouth moderate, slightly oblique, the gape reaching anterior margin of orbit; jaws equal; maxillary concealed by the wide preorbital, its length 2.36 to 2.93 in head; teeth strong, each jaw anteriorly with 4 canines; upper jaw posteriorly with a single pair of strong canines directed forward; other teeth short, more or less coalescent at base; gill-rakers scarcely one-fourth the length of eye, 10 or 11 on lower limb of first arch; lateral line complete and continuous, the anterior pores with 2 or 3 branches; scales large, little reduced on chest, extending on base of soft rays of dorsal and anal; dorsal spines short and strong, the longest slightly longer than eye, separate or slightly connected at base by membrane, the last one attached to soft rays; the middle rays of soft portion produced in adult, the longest ray reaching slightly past base of caudal in largest specimen at hand; caudal in young truncate, distinctly concave in adult, the outer rays produced, nearly twice as long as the middle rays in large specimens; anal spines similar to dorsal spines, the longest nearly as long as snout, the soft portion similar to that of the dorsal; ventrals notably longer than pectorals, reaching to or past vent; pectorals moderate, 1.23 to 1.45 in head.

Color in spirits anteriorly rather dark brown, becoming paler posteriorly; a large dark area under base of dorsal and a smaller area at base of anal; caudal peduncle rather pale olivaceous; dorsal dusky or black, except the posterior 4 or 5 rays which are pale; caudal brown or dusky with pale margin; anal colored similar to dorsal; ventrals black with outer rays pale; pectorals dusky at base, otherwise pale.

Of this species only 2 specimens were obtained, respectively 245 and 275 mm. in length. We also examined specimens from Bermuda, Cuba, San Domingo, Barbadoes and Bahia, Brazil. The above description is based on specimens ranging in length from 175 to 340 mm.

Known from Florida to Brazil. Our specimens are from the Colon market and Porto Bello.

517. **Bodianus diplotænia** (Gill).

Harpe diplotænia Gill, Proc. Ac. Nat. Sci. Phila., 1862, 140 (Cape San Lucas; female); Jordan, Rept. U. S. Fish Comm., XV, 1887 (1891), 629; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 144 (Panama Bay).

Harpe pectorallis Gill, Proc. Ac. Nat. Sci. Phila., 1862, 141 (Cape San Lucas; male).

Cossyphus pectoralis Günther, Cat. Fish. Brit. Mus., IV, 1862, 110.
Cossyphus diplotænia Günther, Cat. Fish. Brit. Mus., IV, 1862, 110.
Bodianus pectoralis Jordan, Proc. U. S. Nat. Mus., 1885, 384.
Bodianus diplotænia Jordan, Proc. U. S. Nat. Mus., 1885, 384.
Bodianus diplotænius Snodgrass & Heller, Proc. Wash. Ac. Sci., VI, 1904 (1905), 391 (Cocos, Clipperton and Galapagos islands); Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 137 (Taboguilla Island, Panama Bay).

Head 3.1 to 3.45; depth 2.73 to 3.25; D. XII, 10 or 11; A. III, 12 to 14; scales 34 or 35.

Body elongate, compressed; dorsal profile in young gently convex, concave over snout in adult; large males with a prominent fleshy pad on forehead over eyes; head rather short, strongly compressed; snout sharply pointed, at least in young, its length 2.25 to 2.6 in head; eye 5.15 to 6.9; mouth moderate, slightly oblique, the gape not quite reaching anterior margin of orbit; jaws about equal; maxillary largely covered by the broad preorbital, 2.6 to 3.1 in head; teeth strong, each jaw anteriorly with 4 canines; the inner pair on upper jaw slightly the larger, on lower jaw the outer pair much the larger; upper jaw posteriorly with a single pair of canines directed forward; the other teeth short and coalescent at base; gill-rakers less than a fourth the length of eye, 12 or 13 on lower limb of first arch; lateral line complete and continuous, the anterior pores with 2 or 3 branches; scales large, little reduced on chest, extending on base of soft rays of dorsal and anal; dorsal spines short, the longest about the length of eye, separate or slightly connected by membrane at base, each enveloped in a heavy dermal coat, the last one connected with the soft rays, the middle rays of soft portion produced in adult, longest ray reaching well past base of caudal in our largest male; caudal truncate in young, distinctly concave in adult, with the outer rays much produced, more than twice the length of the middle rays in large males; anal spines similar to those of dorsal, the last one equal to length of snout, the median soft rays produced in adult, usually somewhat longer than the produced rays of dorsal; ventrals rather longer than pectorals, reaching nearly or quite to vent; pectorals moderate, 1.32 to 1.43 in head.

Color of male in life pale brown, with little red on sides of head, also between pectorals and ventrals, and a reddish area about base of anal; chest greenish; sides with a yellow bar at tip of pectorals, extending from slightly above lateral line downward across abdomen and becoming quite obscure just in front of vent; spinous portion of dorsal with dusky base and reddish margin, the anterior soft rays black, the posterior ones with black base, otherwise red; base of caudal and produced rays with more or less dusky, the rest of fin red; anal fin colored like dorsal; ventrals black with red margin; pectorals deep red with black tip. This color description is based on a large specimen, 480 mm. in length.

Color of female in life anteriorly reddish brown, this color gradually shading into a yellowish brown posteriorly; a black band beginning on snout, running through eye, and divided into 2 bands just behind the eye, the upper one running along back above lateral line, the lower one directed slightly downward anteriorly, assuming a median line of the body, both bands posteriorly broken up into more or less distinct spots; another black band extending from angle of mouth to margin of preopercle; base of caudal with 2 distinct black spots, one above and one below lateral line; dorsal spines dusky at base, otherwise red; anterior rays of dorsal dusky, posterior rays yellowish, produced ray red; outer rays of caudal reddish, the remainder of fin yellow; ventrals rather dark red; pectorals of a slightly paler red. This color description of the female is based on a specimen 300 mm. in length. No marked difference in color between the young and adult female appears to exist.

Of this species we have 13 specimens, 5 males and 8 females; the former range in length from 350 to 480 mm.; the latter from 55 to 300 mm.

Known from Cape San Lucas to the Galapagos Islands and from the coast of Peru. Our specimens are from Panama Bay at Balboa.

188. Genus **Halichœres** Rüppell.

Halichœres Rüppell, Neue Wirbelthiere, 1835, 14 (type *Halichœres bimaculatus* Rüppell).

Hemiulis Swainson, Nat. Hist. & Class. Fish., II, 1839, 228 (type *Labrus guttatus* Bloch).

Chœrojulis Gill, Proc. Ac. Nat. Sci. Phila., 1862, 142 (type *Julis semicinctus* Ayres).

?Iridio Jordan & Evermann, Rept. U. S. Fish Comm., XXI, 1895 (1896), 412 (type *Labrus radiatus* Linnæus).

Body oblong, compressed; head compressed, conic; mouth moderate; preopercle entire; teeth strong, upper jaw anteriorly with 2 large canines, and a single pair posteriorly near angle of mouth; lower jaw anteriorly with 4 strong canines, none posteriorly; gill-rakers poorly developed, short and feeble; gill-membranes slightly joined to the isthmus; scales large, more or less reduced on breast, 25 to 30 in lateral series; head entirely naked; lateral line complete, abruptly curved downward posteriorly; dorsal with 9 spines; anal with 3 spines; ventrals inserted under axil of pectorals; vertebræ 10 + 15 = 25.

KEY TO THE SPECIES.

a. Sides with a dark lateral band, at least in young; adult without black blotch or bar on sides under spinous portion of dorsal, nor with a small black spot at base of last ray of dorsal.

b. Dark lateral band persistent, broad, rather ill-defined, extending from eye to tip of caudal fin; a bluish band, nearly as wide as eye, extending from eye to nape; dorsal fin deep indigo, with pale margin. *cyanocephalus,* p. 716.

bb. Dark lateral band disappearing with age, when present rather narrow, never extending beyond base of caudal; head in adult with several bluish lines; a narrow one, about the width of pupil, extending from eye to nape; dorsal plain yellowish red in young; in adult with a narrow blue stripe at base, above with many blue spots. *radiatus,* p. 717.

aa. Sides never with a dark lateral band; a dark blotch or bar on sides under spinous portion of dorsal, or a small round spot at base of last ray of dorsal usually present, at least in adult.

c. Color rather bright green; a prominent black spot just back of eye, and a small one at base of last ray of dorsal; base of pectoral with a very narrow brownish cross-bar; sides of head, in life, with several reddish bands; no dark bar or blotch on sides of body. *kirschii,* p. 720.

cc. Color somewhat darker; no black spot back of eye or at base of last ray of dorsal; a black blotch or cross-bar on sides, except sometimes in very young.

d. Pores in lateral line not branched; a black blotch in lateral line below sixth and seventh dorsal spines; young with a distinct caudal spot. *dispilus,* p. 721.

dd. Pores in anterior part of lateral line distinctly branched; a black bar on sides under spinous portion of dorsal, except in very young; caudal spot wanting.

e. Body with a more or less reddish hue, at least on chest and abdomen; a conspicuous black bar under base of fifth to seventh dorsal spines present in adult, ill-defined or entirely wanting in young; scales, in young, with dark centers are grouped so as to form several more or less distinct blotches on sides of fish. *sellifer,* p. 722.

ee. Body without reddish hue; the bar on sides less conspicuous and slightly more anteriorly placed; the young unknown.
nicholsi, p. 724.

518. Halichœres cyanocephalus (Bloch).

Labrus cyanocephalus Bloch, Naturg. Ausl. Fische, V, 1791, 139, Pl. CCLXXXVI (locality unknown, probably Surinam).

Julis dimidiatus Agassiz, in Spix, Pisc. Brasil., 1831, 96, Pl. LIII (Brazil).

Icthycallus dimidiatus Swainson, Nat. Hist. & Class. Fish., II, 1839, 232 (name only).

Julis internasalis Poey, Memorias, II, 1861, 421 (Havana).

Platyglossus internasalis Günther, Cat. Fish. Brit. Mus., IV, 1862, 164.

Chœrojulis internasalis Poey, Syn. Pisc. Cub., 1868, 334.

Platyglossus dimidiatus Jordan, Proc. U. S. Nat. Mus., 1886, 45.

Halichœres dimidiatus Jordan, Rept. U. S. Fish Comm., XV, 1887 (1891), 644.

Iridio cyanocephalus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1594.

Head 4.15 to 4.23; depth 3.6 to 3.8; D. IX, 11 or 12; A. III, 12; scales 27.

Body rather slender, compressed; anterior profile rather steep, reaching the height of back slightly back of vertical from posterior margin of eye; head short, compressed; snout blunt, its length 2.45 to 2.9 in head; eye 5.13 to 5.78; mouth moderate, the gape reaching about to anterior margin of eye; jaws equal; maxillary mostly covered by the wide preorbital, 3.25 to 3.4 in head; teeth in jaws strong, upper jaw anteriorly with a pair of large canines, posteriorly near angle of mouth with a pair of slightly smaller ones; lower jaw anteriorly with 4 strong canines, none posteriorly; other teeth short, coalescent at base; gill-rakers very short, about 10 more or less developed on lower limb of first arch; lateral line complete, curved abruptly downward under last rays of dorsal, the anterior pores branched; scales large, not greatly reduced on chest, not crossing median line of back; head naked; dorsal spines short, the soft rays not produced; caudal fin slightly rounded in specimens at hand; ventral moderate, the outer ray somewhat produced, reaching about two-thirds the distance from its base to vent; pectorals moderate, 1.1 to 1.25 in head.

Color in spirits pale brownish or olivaceous; a very broad, blackish lateral band extending from eye to tip of caudal, this band rather faint anteriorly; a broad bluish band upward and backward from eye to nape; a dark band along profile from snout to nape; dorsal very dark indigo at base, with pale margin; caudal with middle rays blackish, outer rays pale; anal brownish at base, with pale margin; ventrals pale; pectorals mostly pale, tips and upper rays brownish.

This species was not taken by us. It is here described from 3 specimens from Havana, Cuba; "West Indies"; and Bahia, Brazil. The range in length is from 200 to 240 mm.

Known from the West Indies south to Brazil.

519. Halichœres radiatus (Linnæus).

Labrus radiatus Linnæus, Syst. Nat., Ed. X, 1758, 288 (America).

Sparus radiatus Linnæus, Syst. Nat., Ed. XII, 1766, 472 (Carolina).

Labrus brasiliensis Bloch, Naturg. Ausl. Fische, V, 1791, 125, Pl. CCLXXX (Brazil; on a drawing of *Pudiano verde* by Prince Maurice of Nassau).

Labrus bivittatus Bloch, Naturg. Ausl. Fische, V, 1791, 133, Pl. CCLXXXIV, fig. 1 (from a painting by Plumier, made at Martinique).

Labrus psittaculus Lacépède, Hist. Nat. Poiss., III, 1802, 523 (Martinique; from a copy of Plumier's painting).

Julis crotaphus Cuvier, Règne Animal, Ed. II, II, 1829, 258 (based on *Doncella* of Parra).

Julis psittaculus Cuvier & Valenciennes, Hist. Nat. Poiss., XIII, 1839, 387.

Julis cyanostigma Cuvier & Valenciennes, Hist. Nat. Poiss., XIII, 1839, 391 (Martinique).

Julis opalina Cuvier & Valenciennes, Hist. Nat. Poiss., XIII, 1839, 392 (Martinique).

Julis patatus Cuvier & Valenciennes, Hist. Nat. Poiss., XIII, 1839, 398 (Martinique).

Julis principis Cuvier & Valenciennes, Hist. Nat. Poiss., XIII, 1839, 402 (Bahia, Brazil).

Chloricthys braziliensis Swainson, Nat. Hist. & Class. Fish., II, 1839, 232 (name only).

Julis humeralis Poey, Memorias, II, 1860, 212 (Havana).

Platyglossus cyanostigma Günther, Cat. Fish. Brit. Mus., IV, 1862, 161.

Platyglossus opalinus Günther, Cat. Fish. Brit. Mus., IV, 1862, 163.

Platyglossus principis Günther, Cat. Fish. Brit. Mus., IV, 1862, 164.

Platyglossus bivittatus Günther, Cat. Fish. Brit. Mus., IV, 1862, 164.

Platyglossus humeralis Günther, Cat. Fish. Brit. Mus., IV, 1862, 165.

Chœrojulis grandisquamis Gill, Proc. Ac. Nat. Sci. Phila., 1863, 206 (Beaufort, N. C.).

Chœrojulis cyanostigma Poey, Syn. Pisc. Cub., 1868, 334 (Havana).

Chœrojulis bivittatus Poey, Syn. Pisc. Cub., 1868, 335.

Chœrojulis humeralis Poey, Syn. Pisc. Cub., 1868, 335.

Chœrojulis arangoi Poey, Enumeratio, 1875, 109 (Havana).

Chœrojulis radiatus Goode, Bull. U. S. Nat. Mus., V, 1876, 35.

Platyglossus florealis Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 287 (Pensacola, Fla.).

Platyglossus grandisquamis Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1882 (1883), 603.

Halichœres radiatus Jordan, Rept. U. S. Fish Comm., XV, 1887 (1891), 641.

Halichœres bivittatus Jordan, Rept. U. S. Fish Comm., XV, 1887 (1891), 645, Pls. V, VI.

Iridio radiatus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1590, Pl. CCXXXIX, fig. 600.

Iridio bivittatus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1595, Pl. CCXXXIX, fig. 601; Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 405 (Toro Point, Colon).

Head 3.6 to 4.25; depth 2.6 to 4.8; D. IX, 11; A. III, 12; scales 26 to 28.

Body rather slender in young, the depth increasing greatly with age; dorsal profile anteriorly very steep in adult, moderately convex in young; head very short and deep in adult; snout rather pointed in young, rather short and blunt in adult, its length 2.1 to 3.5 in head; eye 3.7 to 7.55; mouth moderate, the gape scarcely reaching anterior margin of eye; jaws equal; maxillary largely covered by the broad preorbital, 2.65 to 3.7 in head; teeth strong, upper jaw anteriorly with a pair of strong canines, and a smaller pair posteriorly near angle of mouth; lower jaw anteriorly with 4 canines, none posteriorly; other teeth short, conical; gill-rakers very short, 9 to 11 on lower limb of first arch; scales large, not greatly reduced on chest; head entirely naked; lateral line curved abruptly downward under posterior rays of dorsal, nearly all the pores more or less branched; dorsal spines short, slender, soft rays not produced; caudal rounded in young, emarginate in large examples, the upper rays longer than the lower ones; anal spines slender, the soft portion similar to that of the dorsal; ventrals about the length of postorbital part of head in very young, proportionately much longer in adult, with the outer rays much produced, more than twice the length of the inner rays, slightly longer than distance from snout to margin of preopercle; pectorals of moderate length, 1.13 to 1.65 in head.

Color of young in life dark brownish green; sides greenish; abdomen pale; chest red; a conspicuous black lateral band from snout to base of caudal; a much narrower and fainter band from below base of pectoral along edge of abdomen, disappearing posteriorly; a yellowish streak on side of head just below the black lateral band; cheeks below this streak reddish; margin of opercle yellowish; a red band across lower jaw from posterior angles of mouth; dorsal, caudal and anal mostly yellowish red; a very small dark spot at base of last ray of dorsal; pectorals and ventrals slightly yellowish or pale. When the fish reaches a length of about 125 mm., an opercular spot which is darker than the lateral band has formed; the lower band has almost disappeared; the small black spot at base of last dorsal rays is no longer visible. In specimens about 170 mm. long the lower band has wholly disappeared, the upper one has become indistinctly outlined and more or less broken up into blotches; the opercular spot remains very distinct. Base of dorsal and anal, and tips of outer caudal rays are dusky. Color of adult specimen 340 mm. long, generally greenish, no trace of lateral band or opercular spot; numerous scales each with a round pearly blue spot at base, these becoming elongate at nape and on caudal peduncle; a blue streak from nape through eye to snout, one blue streak backward from eye; another just below eye; another from posterior angle of mouth across lower part of cheek, curving upward on opercle; a rather broader one on interopercle; lower jaw with 2 blue cross-bands; dorsal with a narrow blue stripe at base, above this with many blue spots; caudal with many blue spots, some of them confluent, forming longitudinal lines; anal with a row of blue spots at base, a blue bar on lower third, a narrower and more or less broken bar on distal third, then a rather wide blue margin; ventrals with spine and outer ray blue, the rest of fin mostly pale; pectorals with a black spot at base of upper ray, the fin plain translucent, shaded with blue.

We have 42 specimens of this species, ranging in length from 30 to 140 mm. We also examined numerous specimens of various sizes, the largest 420 mm. in length, in the National Museum collection.

After examining the numerous specimens as noted above, we are convinced that with its several synonyms, as understood by Jordan (Rept. U. S. Fish Comm., XV, 1887 (1891) pp. 641 and 645), *H. bivittatus* merely represents the young of the present species. The great variation, with age, in the depth of the fish is characteristic of this entire group, although it seems to reach its most extreme proportions in the present species, which also shows considerable variation in this respect, among individuals of like size. The difference in the shape of the fins, as given, is clearly due to age, as is very probably also the change in color. It is a singular fact that of the numerous specimens examined, which were taken at various times and places, there is not a specimen less than about 170 mm. in length that answers to the description of *H. radiatus,* as heretofore understood. Nor is there one larger that will well fall in with *H. bivittatus.* It, however, at about this age becomes difficult to determine to which nominal species the individuals should be referred. If the two were really distinct, it would seem very strange that apparently no young of *H. radiatus* have been taken.

Known from North Carolina southward to Brazil. Our specimens are from Toro Point; Fox Bay, Colon; Colon Reef, and Porto Bello.

520. Halichœres kirschii (Jordan & Evermann).

Julis crotaphus Cuvier & Valenciennes, Hist. Nat. Poiss., XIII, 1839, 395 (Bahia; not of Cuvier).

Platyglossus crotaphus Günther, Cat. Fish. Brit. Mus., IV, 1862, 163.

Chœrojulis crotaphus Poey, Enumeratio, 1875, 109.

Halichœres poeyi Jordan, Rept. U. S. Fish Comm., XV, 1887 (1891), 646 (not of Steindachner).

Iridio kirschii Jordan & Evermann, Rept. U. S. Fish Comm., XXI, 1895 (1896), 413 (Bahia; name only); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1598.

Head 3.67 to 4.05; depth 3.8 to 4.55; D. IX, 11; A. III, 12; scales 26 or 27.

Body elongate, compressed, increasing in depth with age; dorsal profile anteriorly rather steep, convex, highest at origin of dorsal; head rather short, compressed; snout moderately pointed, its length 2.66 to 3.5 in head; eye 3.9 to 4.9; mouth moderate, the gape reaching anterior margin of eye; jaws equal; maxillary largely covered by the wide preorbital, 3.05 to 3.8 in head; teeth rather strong, upper jaw anteriorly with one pair of canines and posteriorly near angle of mouth with another pair; lower jaw anteriorly with 4 canines, none posteriorly; other teeth short but strong; gill-rakers very short, about 9 more or less developed on lower limb of first arch; scales large, little reduced on chest, not crossing median line of back, head naked; lateral line complete, curved abruptly downward under last rays of dorsal, the pores in anterior portion branched; dorsal spines short, none of the rays produced; caudal fin slightly rounded; anal with 3 spines, the soft portion similar to that of the dorsal; ventrals rather small, slightly shorter than pectorals, the outer ray produced in adult; pectorals moderate, 1.37 to 1.6 in head.

Color in life rather bright green above, slightly paler below; a narrow lateral band of paler green from posterior angle of opercle to slightly below middle of base of caudal; a very faint band beginning below base of pectorals and running along edge of abdomen; sides of head with a reddish band extending from lips to margin of opercle; another red band from eye to upper edge of base of pectoral, extending downward past pectoral; a third red band directly back of eye to margin of opercle; a prominent black spot just back of eye; dorsal, caudal and anal greenish, tinged with red; a black spot at base of last ray of dorsal; pectoral and ventral green, the former with a black line across its base.

Of this species 7 specimens, ranging from 75 to 100 mm. in length, were seined in one day. The species, thereafter, was never again seen. The above description is based on these and the 2 type specimens, 130 and 155 mm. in length, from Bahia, Brazil.

Known from the West Indies south to Brazil. Our specimens are from Fox Bay, Colon.

521. Halichœres dispilus (Günther).

Platyglossus dispilus Günther, Proc. Zoöl. Soc. London, 1864, 25 (Panama).

Halichœres dispilus Jordan, Rept. U. S. Fish Comm., XV, 1887 (1891), 646; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 146 (Panama Bay); Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 138 (Acapulco).

Iridio dispilus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1597, Pl. CCXL, fig. 602.

Head 3.44 to 4.2; depth 3.36 to 4.55; D. IX, 11; A. III, 12; scales 27.

Body moderately elongate, compressed, increasing notably in depth with age; dorsal profile anteriorly rather steep in adult; head short, compressed; snout moderately pointed in young, rather blunt in adult, its length 2.7 to 4.2 in head; eye 4.6 to 6.0; mouth rather small, the gape scarcely reaching anterior margin of eye; jaws equal; maxillary mostly covered by the broad preorbital, 3.2 to 4.2 in head; teeth rather strong; upper jaw anteriorly with a single pair of canines, posteriorly near angle of mouth with another pair directed forward; lower jaw anteriorly with 4 canines, none posteriorly; other teeth short, but strong; gill-rakers poorly developed, about 8 short ones on lower limb of first arch; scales large, not much reduced on chest, and not crossing median line of back; lateral line complete, abruptly curved downward or sometimes interrupted under last rays of dorsal, the pores not branched; first dorsal with 9 rather short, pungent spines, and 11 rays, none of them produced; caudal fin in young slightly rounded, with the middle rays the longest, concave in adult, the outer rays slightly produced in our largest specimens, the middle rays the shortest; anal with 3 short spines, the soft portion similar to that of dorsal; ventrals small, notably shorter than pectorals, the outer ray not notably produced; pectorals moderate, 1.28 to 1.43 in head.

Color in spirits olivaceous; some specimens considerably darker than others; young with a pale lateral band from just above base of pectoral to slightly below the middle of base of caudal. Our largest specimen with a pale area at shoulder, and another behind base of pectorals; sides of head with 4 pale longitudinal streaks, two below eye and two extending backward from eye; opercle with a dark-bluish area; a prominent black spot, larger than eye, in lateral line below sixth and seventh dorsal spines; this spot broken up into 3 or 4 smaller spots in specimens about 100 mm. in length; very young again with but a single spot, not larger than the pupil; very young with a prominent caudal spot, breaking up into 2 more or less distinct spots, becoming obscure and fading away when the fish reaches a length of about 130 mm.; fins pale in young; in large examples, and especially the more darker colored ones, the dorsal and anal largely dusky; the dorsal with a row of pale spots at base.

Of this species 33 specimens were preserved, ranging in length from 40 to 170 mm.

Known from Mazatlan to Peru. Our specimens are from the rocky shores of Naos Island and from Panama Bay near Balboa.

522. **Halichœres sellifer** Gilbert.

Halichœres sellifer Gilbert, Proc. U. S. Nat. Mus., 1890, 67 (Clarion Island); Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 144 (Panama Bay); Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 138 (Acapulco).

Irido sellifer Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1592.

Halichœres macgregori Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 145, Pl. XXIII, fig. 45 (Panama Bay).

Pseudojulis notospilus Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 139, Pl. VI, fig. 2 (Acapulco; in part).

Head 3.65 to 4.75; depth 3.0 to 3.85; D. IX, 11 or 12; A. III, 12 or 13; scales 27 or 28.

Body rather deep, compressed, getting deeper with age; back considerably elevated in adult; anterior profile convex; head very short and deep in adult; snout rather pointed in young, becoming rather blunt with age, its length 1.46 to 3.55; eye 4.2 to 7.9; mouth moderate, the gape reaching about anterior margin of eye; jaws equal; maxillary largely covered by the wide preorbital, 2.9 to 4.0 in length of head; teeth strong, the upper jaw anteriorly with a pair of canines, and posteriorly with another pair directed forward; the largest specimen, 395 mm. long, with 2 pairs of canines posteriorly on upper jaw; lower jaw anteriorly with 4 canines, none posteriorly; other teeth short, conical; gill-rakers very short, 8 to 10 more or less developed on lower limb of first arch; scales large, not greatly reduced on chest; head naked; lateral line complete, curved abruptly downward under posterior rays of dorsal, the pores on anterior portion branched; dorsal with 9 rather short, slender spines and 11, rarely 12, soft rays, none of them produced; caudal fin rounded in young, very slightly emarginate in adult, none of the rays produced; anal with 3 rather weak spines, and with 12, rarely 13, soft rays similar to those of dorsal; ventrals rather short in young, not nearly reaching vent, the outer rays much produced in adult, becoming about 3 times the length of the inner rays and reaching origin of anal; pectorals moderate, not greatly changed by age, 1.16 to 1.4 in head.

Color of a fresh specimen, 275 mm. long, generally greenish above, paler below; scales below with a red base, those along back and upper part of sides with dark brown or blue center and bluish margin; region about eye and opercle with sky-blue spots; a conspicuous black bar under the base of the fifth to seventh dorsal spine, extending downward to about the middle of side; dorsal green at base, the distal half red, about the middle of fin with a series of sky-blue spots; caudal green, with reddish margin; anal green on basal two-thirds, distal third red, 2 broken streaks of sky-blue on green portion; ventrals pale green, with the exterior rays red; pectorals pale green. The young are notably darker in color; a specimen 70 mm. in length answers the following description; many scales with a dark brown spot at base, those so marked arranged in groups, forming more or less distinct blotches on sides of fish; no black bar under dorsal; sides of head behind eye with 3 or 4 narrow black lines, the lower two joined by cross-branches; a dusky band on lower part of cheeks, turning downward and backward across base of pectoral; dorsal with several indistinct dusky blotches, the one on anterior spines the most distinct; a very conspicuous elliptical, jet-black spot on basal portion of first 4 rays of soft dorsal; caudal uniformly dusky; anal with 2 rather indistinct dusky lines, one at base, the other on distal third; outer rays of ventrals dusky, remainder of fins pale; pectorals uniformly pale. When the fish reaches a length of about 95 mm. nearly every scale on side has a dark brown base and the blotches above described become indistinct. There is as yet scarcely a trace of the black bar under dorsal, which is characteristic of the adult. In specimens 120 mm. long this bar has formed as a very broad, ill defined blotch. The elliptical spot on base of soft rays of dorsal has become pale dusky and its outline is only faintly visible. The markings on the sides of head have become very indistinct. In our largest specimens the blue green color predominates; on the shoulder in front of the black bar are 2 or 3 yellow spots.

Of this species we have 21 specimens, ranging in length from 70 to 395 mm. We have also examined the type.

Our rather large series, containing specimens of all sizes, demonstrates without doubt that the fish described as *Halichœres macgregori* (Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, p. 145) is the young of *H. sellifer*.

Known from Revillagigedo Archipelago to Panama. Our specimens are from Panama Bay, at Balboa; tide pools, Panama; and Panama City market.

523. **Halichœres nicholsi** (Jordan & Gilbert).

Platyglossus nicholsi Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881, 231 (Braithwaite Bay, Socorro Island).

Halichœres nicholsi Jordan, Rept. U. S. Fish Comm., XV, 1887 (1891), 642; Snodgrass & Heller, Proc. Wash. Ac. Sci., VI, 1904 (1905), 395 (Charles Island).

Iridio nicholsi Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1591.

Head 3.5; depth 3.5; D. IX, 12 or 13; A. III, 11 or 12; scales 28.

Body deep, compressed; head entirely naked; scales not crossing median line of back.

No specimens of this species were seen by us. It appears to differ from *H. sellifer* chiefly in the absence of the reddish hue of that species, and in the more obscure and more anteriorly placed black band under the dorsal. Owing to the variation in color among individuals, the present writers are strongly of the opinion that the two will eventually prove to be identical.

Known from the Revillagigedo and Galapagos archipelagos. Not recorded from the shores of the mainland.

189. Genus **Pseudojulis** Bleeker.

Pseudojulis Bleeker, Versl. Ak. Amsterdam, XIII, 1862, 99 (type *Pseudojulis girardi* Bleeker).

Julidio Jordan & Evermann, Rept. U. S. Fish Comm., XXI, 1895 (1896), 413 (type *Pseudojulis adustus* Gilbert).

Body compressed, slender; upper jaw with 2 strong canines in front; lower jaw with 2 or 4 canines*, the outer ones, if present, often very slightly enlarged; no posterior canines; scales large, fewer than 30 in a lateral series, those on chest somewhat reduced; head entirely naked; lateral fin complete, abruptly curved downward posteriorly; dorsal spines 9; anal spines 3. This genus differs from *Halichœres* chiefly in the absence of the posterior canines.

524. **Pseudojulis notospilus** Günther.

Pseudojulis notospilus Günther, Proc. Zoöl. Soc. London, 1864, 26 (Panama); Jordan, Rept. U. S. Fish Comm., XV, 1887 (1891), 649; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 146 (Panama Bay); Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 139 (Acapulco; in part).

Julidio notospilus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1603.

Head 3.37 to 3.97; depth 3.28 to 4.0; D. IX, 11; A. III, 12; scales 26 or 27.

Body elongate, compressed, moderately robust; the back elevated; profile from snout to nape strongly convex, especially in adult; head short; snout rather blunt, becoming more so with age, its length 2.64 to 4.74 in head; eye 4.25 to 5.0; mouth moderate, the gape reaching about to anterior margin of eye; jaws equal; maxillary mostly concealed by the preorbital, 3.22 to 4.74 in head; teeth strong; the upper jaw with 2 strong canines in front; lower jaw with 2 strong canines and a pair

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*The presence of 2 or 4 canines in lower jaw appears to be valueless as a generic character, as the outer pair may appear only slightly smaller than the inner pair, as in *P. adustus*; notably smaller, as in *P. notospilus*; somewhat larger than the succeeding jaw teeth, as in *P. melanotis;* or not at all enlarged, as in *P. inornatus.*

of smaller ones on the outside of them; no posterior canines; gill-rakers very short, about 9 on lower limb of first arch; scales large, head entirely naked; lateral line complete, abruptly curved downward under posterior rays of dorsal, the pores mostly with 2 or 3 branches; dorsal with 9 short, pungent spines, and 11 soft rays, none of the latter produced; caudal evenly rounded; anal with 3 spines, the soft portion similar to that of the dorsal; ventrals moderate, none of the rays produced; caudal evenly rounded; anal with 3 spines, the soft portion similar to that of the dorsal; ventrals moderate, none of the rays produced; pectorals rather long, 1.2 to 1.33 in head.

Color in life brownish or olivaceous above; deep green, pale green, or reddish below; back with several more or less distinct blackish bands; a very small dark spot just back of eye present in young; opercle with a bluish area; vertical fins usually more or less dusky, with bluish margins; dorsal in young with a prominent, jet-black, elliptical spot at base of the first 3 or 4 soft rays, this later becomes confluent with the blackish bar underneath it; outer rays of ventrals dusky; pectorals pale greenish, with a brownish bar across base.

Of this species we have 180 specimens, ranging in length from 40 to 130 mm.

Known from Mazatlan southward to Panama. Our specimens are from Taboga Island, Balboa, and Panama. The species is very abundant in rocky tide pools.

190. Genus **Thalassoma** Swainson.

Thalassoma Swainson, Nat. Hist. & Class. Fish., II, 1839, 224 (type *Labrus purpureus* Rüppell).

Chlorichthys Swainson, Nat. Hist. & Class. Fish., II, 1839, 232 (type *Labrus bifasciatus* Bloch).

Body oblong or elongate, moderately compressed; head rather small; snout blunt; anterior canines moderate, 2 in each jaw, those in lower jaw sometimes not much larger than teeth next to them; no posterior canines; scales large; head entirely scaleless; lateral line complete, abruptly curved downward posteriorly; dorsal spines 8; anal spines 3, the first one very small.

KEY TO THE SPECIES.

a. Body slender, its depth 4.1 to 4.75 in its length; head small, 3.8 to 4.16 in length; body brownish above, pale underneath, with a broad black lateral band; no cross-bar; head not darker than rest of body, its ventral surface pale. *lucasanum,* p. 727.

aa. Body deeper, its depth 3.06 to 3.9 in its length; head larger, 3.4 to 3.8 in the length; body without lateral band; except in very young; a broad yellowish cross-bar at occiput; head entirely blue black, notably darker than rest of body. *duperrey,* p. 728.

525. Thalassoma lucasanum (Gill).

Julis lucasanus Gill, Proc. Ac. Nat. Sci. Phila., 1862, 142 (Cape San Lucas).

Julis lucasana Günther, Proc. Zoöl. Soc. London, 1864, 26.

Thalassoma lucasanum Jordan, Proc. Cal. Ac. Sci., 2nd Ser., V, 1895, 482; Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 141 (Acapulco; Taboguilla Island, Panama Bay).

Chlorichthys lucasanus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1607.

Head 3.8 to 4.16; depth 4.1 to 4.75; D. VIII, 13; A. III, 11; scales 27 or 28.

Body elongate, compressed; back not greatly elevated, anterior profile evenly convex; head moderate; snout short and blunt, its length 2.8 to 4.0 in head; eye 4.25 to 5.0; mouth small; jaws equal; maxillary not reaching anterior margin of eye, 3.4 to 4.15 in head; each jaw anteriorly with a pair of canines, the teeth next to them somewhat enlarged; lateral teeth short, conical; no posterior canines; gill-rakers very short and poorly developed; gill-membranes broadly connected across isthmus; scales large, reduced on chest; head entirely naked, with many mucous pores; lateral line complete, curved abruptly downward under last rays of dorsal, the pores all branched; dorsal with 8 spines, graduated, the soft portion low, none of the rays produced; caudal slightly rounded in very young, the outer rays slightly produced in adult, making the outer margin distinctly concave; anal with 3 spines, the first one very small, the soft portion similar to that of dorsal; ventrals small, less than half the length of pectorals; pectorals moderate, 1.13 to 1.34 in head.

Color in spirits brown above, pale below, with a broad, black, lateral band extending from eye to base of caudal, becoming indistinct posteriorly and merging into the brown of the back; dorsal black, with a pale margin; caudal pale, with the outer rays black, narrowly edged with pale; anal dusky at base, with a broad, pale margin; ventrals pale; pectorals with more or less dusky and a black spot at base of upper ray.

This species was not taken by us. It is here described from 9 specimens from Taboguilla Island, collected by the Albatross, and ranging in length from 70 to 120 mm. We also examined the type specimens from Cape San Lucas, and 3 small specimens from Tres Marias Island.

Known from Acapulco south to Panama. Recorded from Panama by Günther (Proc. Zoöl. Soc. London, 1864, p. 26), and from Taboguilla Island, Panama Bay, by Kendall and Radcliffe (Memoir. Mus. Comp. Zoöl., XXXV, 1912, p. 141).

526. Thalassoma duperrey (Quoy & Gaimard).

Julis duperrey Quoy & Gaimard, in Freycinet, Voy. Uraine et Physicienne, Zoöl., 1824, 268, Pl. LVI, fig. 2 (Sandwich Islands).

Julis clepsydralis Smith & Swain, Proc. U. S. Nat. Mus., 1882, 136 (Johnston's Island).

Thalassoma pyrrhovinctum Jenkins, Bull. U. S. Fish Comm., XIX, 1899 (1901), 51, fig. 7 (Honolulu).

Thalassoma duperrey Jenkins, Bull. U. S. Fish Comm., XXII, Part I, 1902 (1904), 463; Jordan & Evermann, Bull. U. S. Fish Comm. XXIII, 1903 (1905), 302, fig. 130, Pl. XXXV; Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1921, 140.

Head 3.4 to 3.8; depth 3.06 to 3.9; D. VIII, 12 or 13; A. III, 11; scales 27 to 29.

Body elongate, rather deep, compressed; the back moderately elevated; anterior profile evenly convex; head rather small; snout blunt, its length 2.7 to 3.44 in head; eye 4.3 to 5.35; mouth moderate, nearly horizontal; jaws equal; maxillary largely hidden under the preorbital, 4.1 to 5.0 in head; each jaw anteriorly with 2 canines, teeth next to them somewhat enlarged; lateral teeth short, conical; no posterior canines; gill-rakers very short, poorly developed; gill-membranes connected across isthmus; scales large, reduced on chest, head entirely naked, with many mucous pores; lateral line complete, abruptly curved downward under posterior rays of dorsal; dorsal with 8 pungent, graduated spines, soft portion rather low, none of the rays produced; caudal rounded in young, its margin deeply concave, with the outer rays produced in adult; anal with 3 spines, the first one very small, the soft portion similar to that of the dorsal; ventrals small, the outer ray somewhat produced in adult; pectorals moderate, 1.13 to 1.23 in head.

Color rather variable. An alcoholic specimen 115 mm. in length from Taboguilla Island has the head black-blue, a broad pale bar passing from occiput downward back of base of pectorals; the rest of body plain brownish; dorsal brownish, with pale margin; caudal black, the outer rays narrowly edged with pale; anal pale brown, with pale margin; ventrals slightly brownish; pectorals with a black blotch at base of upper ray, extending on ray, the distal third of fin with jet-black bar. Specimens from Hawaii are much darker. Very young have a black lateral band, and the fins are mostly pale. The black band soon becomes indistinct and the paler band at occiput begins to appear.

This species was not taken by us. It is here described from a specimen from Taboguilla Island, collected by the Albatross, and from numerous specimens from Hawaii, ranging in length from 30 to 165 mm.

Known from the tropical Pacific. It is very abundant about the Hawaiian Islands, and recorded from Taboguilla Island, Panama Bay, by Kendall & Radcliffe (Memoir. Mus. Comp. Zoöl., XXXV, 1912, 140).

191. Genus **Xyrichthys** Cuvier.

Xyrichthys Cuvier, Mém. Mus. Hist. Nat. Paris, I, 1815, 317, 329, 355 (type *Xyrichthys cultratus* Cuvier=*Coryphæna novacula* Linnæus).

Novacula Cuvier, Règne Animal, Ed. I, II, 1817, 265 (type *Coryphæna novacula* Linnæus).

Amorphocephalus Bowdich, Excursions in Madeira, 1825, 238 (type *Amorphocephalus granulatus* Bowdich).

Body rather deep, strongly compressed, deepest behind occiput, thence tapering backward; head short and very deep, its anterior profile almost vertical in adult, compressed into a sharp edge; eye small, placed high; preorbital extremely deep; snout not greatly in advance of forehead; mouth rather small, low and horizontal; each jaw with 2 anterior canines; no posterior canine; scales large, little reduced on chest; head mostly naked, with few scales below and back of eyes; lateral line interrupted posteriorly, reappearing lower down on caudal peduncle; dorsal fin continuous, with 9 slender, graduated spines.

527. Xyrichthys psittacus (Linnæus).

Coryphæna psittacus Linnæus, Syst. Nat., Ed. XII, 1766, 488 (Charleston, S. C.).

Coryphæna lineata Gmelin, Syst. Nat., 1789, 1195 (Charleston, S. C.).

Xyrichthys lineatus Cuvier & Valenciennes, Hist. Nat. Poiss., XIV, 1839, 50; Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882 (1883), 609.

Xyrichthys vermiculatus Poey, Memorias, II, 1860, 215 (Havana, Cuba).

Novacula lineata Günther, Cat. Fish. Brit. Mus., IV, 1862, 171.

Xyrichthys venustus Poey, Enumeratio, 1875, 110 (Cuba).

Xyrichthys psittacus Goode & Bean, Proc. U. S. Nat. Mus., 1884, 45;

Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1618, Pl. CCXLII, fig. 607.

Head 3.86 to 4.35; depth 2.85 to 3.85; D. IX, 12; A. III, 12; scales 27 to 29.

Body deep, very strongly compressed; head short, compressed, extremely deep, its anterior profile very steep, ascending in a straight line, compressed into a keel; snout little in advance of forehead in adult, rather longer and more strongly projecting in young, its length 1.4 to 2.53 in head; eye 4.52 to 5.5; preorbital extremely wide; mouth moderate, horizontal; jaws equal; maxillary failing to reach anterior margin of eye, not concealed by preorbital, 3.1 to 3.53 in head; each jaw anteriorly with 2 strong canines in front; posterior canines wanting; other teeth short, conical; gill-rakers very poorly developed; gill-membranes broadly united at isthmus; scales large, little reduced on chest; head mostly naked, with few scales below and back of eye; lateral line interrupted under posterior rays of dorsal, reappearing on middle of caudal peduncle, none of the pores branched; dorsal with 9 slender spines, graduated, the last ray of soft portion produced in adult, reaching to or past base of caudal; caudal truncate or slightly rounded; anal with 3 slender spines, the soft portion similar to that of dorsal; ventrals rather small, the outside ray produced in adult; pectorals moderate, 1.2 to 1.45 in head.

Color in spirits mostly pale or slightly brownish; in life rose-red or brownish, with a blue vertical streak on sides, and with a pale or silvery area behind and below pectorals, the latter often wanting or disappearing in spirits; cheeks with narrow bluish vertical bands; dorsal plain; caudal with several narrow, dark cross-bands; and with oblique olivaceous streaks.

This species was not taken by us. It is here described from specimens from South Carolina, Florida, Nassau, Cuba, and Cozumel, ranging in length from 95 to 200 mm.

Known from South Carolina southward to Bahia, Brazil; not recorded from Panama.

192. Genus **Doratonotus** Günther.

Doratonotus Günther, Cat. Fish. Brit. Mus., IV, 1862, 124 (type *Doratonotus megalepis* Günther).

Body rather strongly compressed, elongate; head pointed, its dorsal profile straight or slightly concave, not compressed into a keel; preorbital rather narrow, shielding posterior part of maxillary; each jaw with 2 canines in front, upper jaw with a small canine posteriorly; gill-membranes united, free from the isthmus; scales large; cheeks and opercles scaly; lateral line interrupted posteriorly, beginning again on middle of caudal peduncle; dorsal with 9 pungent spines, the anterior ones elevated, longer than the succeeding ones, making the outer margin of fin concave; caudal rounded; colors brilliant.

528. **Doratonotus megalepis** Günther.

Doratonotus megalepis Günther, Cat. Fish. Brit. Mus., IV, 1862, 125 (Caribbean Sea); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1611.

Doratonotus thalassinus Jordan & Gilbert, Proc. U. S. Nat. Mus., 1884, 28 (Key West, Fla.).

Doratonotus decoris Evermann & Marsh, Rept. U. S. Fish Comm., XXV, 1899 (1900), 354 (Ponce, Porto Rico); Breder, Zoologica, IV, Pt. 4, 1925, 155, fig. 38 (Caledonia Bay).

Head 3.1 to 3.55; depth 2.66 to 3.13; D. IX, 9 or 10; A. III, 9; scales 20 to 25.

Body rather deep, strongly compressed; the back considerably elevated; profile from snout to nape straight or slightly concave; head rather deep; snout sharply pointed, notably longer than eye, its length 2.9 to 4.0 in head; eye 4.05 to 4.82; mouth rather small, the gaps failing to reach anterior margin of eye; jaws equal; maxillary posteriorly covered by the preorbital, 3.0 to 4.5 in head; teeth strong; each jaw with 2 canines in front, the teeth next to the canines somewhat enlarged; other teeth short, rather pointed; gill-rakers extremely weak, about 6 slightly developed; gill-membranes united, free from the isthmus; scales large, extending up on base of dorsal and anal; cheeks, opercle, and preopercle scaly; lateral line interrupted near end of dorsal, reappearing on middle of caudal peduncle; pores in anterior portion slightly branched; dorsal with 9 pungent spines, the first 2 with filamentous appendages, the second spine the longest, from thence decreasing in length to fourth or fifth spine, the posterior spines graduated, soft portion higher than the spines, without elevated lobe; caudal slightly rounded; anal with 3 spines, the soft portion similar to that of dorsal; ventrals moderate, an elongate scale between them; pectoral rather broad, 1.5 to 1.8 in head.

Color variable, pale green to deep green in life; sides usually with 2 or 3 more or less distinct, pinkish, longitudinal bands, these slightly visible as pale streaks in preserved specimens; sides various, without trace of maroon spots or blotches, with few maroon dots, or with irregular spots, blotches and bars, becoming dusky in spirits; a dark opercular blotch usually present; a very short brownish bar just back of eye seldom wanting; a dark brown bar from eye to snout present on specimens bearing maroon markings; iris deep green, with red border around pupil; fins in some specimens all plain green, with pinkish margin, reddish in others and variously spotted or barred with dusky or maroon; a very small, dark spot often present on membrane between last rays of dorsal and anal; base of caudal often with a dark red or rusty bar, sometimes with blotches of the same color near tips of outer rays of fin, these occasionally confluent, forming a bar.

Of this species we have 22 specimens, ranging in length from 30 to 60 mm.

Known from Florida southward to Panama. It apparently is a rather rare species. Our specimens were all taken from among eel-grass in Fox Bay, Colon, and at Porto Bello.

Family LXII. Scaridæ.

THE PARROT-FISHES.

Body oblong, moderately compressed; mouth moderate, terminal; lips not thickened; teeth in the jaws coalesced, at least at the base, usually forming continuous plates, with an externally evident median suture, often with one or more free canines above the cutting edge; no teeth on vomer or palatines; lower pharyngeals large, forming a quadrangle, with a more or less concave surface; scales large, cycloid, 23 to 26 in lateral series; dorsal fin continuous, its formula almost constantly IX, 10, the spines weak and flexible or stiff and pungent; anal constantly III, 9, the spines very weak, the first one often overlooked.

KEY TO THE GENERA.

a. Teeth not fully coalesced, not forming continuous plates; the anterior teeth enlarged, often more or less canine-like; the median suture of jaws not evident externally. *Cryptotomus*, p. 733.

aa. Teeth in jaws fully coalesced, forming continuous plates; the median suture of jaws evident externally.

b. Dorsal spines flexible; lower jaw included in the upper when mouth is closed; cheeks with 2 or more rows of scales; lower pharyngeals much longer than broad.

c. Teeth pale. *Scarus*, p. 735.

cc. Teeth bluish or green. *Pseudoscarus*, p. 744.

bb. Dorsal spines stiff, pungent; upper jaw included in the lower when mouth is closed. *Sparisoma*, p. 747.

193. Genus **Cryptotomus** Cope.

Calliodon Cuvier, Règne Animal, Ed. II, II, 1829, 266 (type *Scarus spindens* Quoy & Gaimard; not *Calliodon* of Gronow or of Bloch & Schneider).

Cryptotomus Cope, Trans. Amer. Philo. Soc. Phila., XIV, 1871, 462 (type *Cryptotomus roseus* Cope).

Lateral teeth of upper jaw coalescent, forming a more or less complete cutting edge; the anterior teeth more separate, often developed as canines; free canines often present on side of upper jaw; lower jaw laterally with a single series of partly coalescent teeth, anteriorly with 2 or more series of more separate teeth, some of these often enlarged, more or less canine-like; the median suture of jaws not evident externally; scales large, a single row on cheeks, 4 or 5 on median line before dorsal; dorsal spines flexible.

KEY TO THE SPECIES.*

a. Body deep, rather strongly compressed, its depth 3.08 to 3.2 in its length; anterior teeth in lower jaw not larger than the lateral ones. *ustus*, p. 733.

aa. Body very slender, little compressed, its depth 4.1 to 4.3 in its length; anterior teeth in lower jaw larger than the lateral ones. *roseus*, p. 734.

529. Cryptotomus ustus (Cuvier & Valenciennes).

Callyodon ustus Cuvier & Valenciennes, Hist. Nat. Poiss., XIV, 1839, 286, Pl. CCCCV (Brazil); Günther, Cat. Fish. Brit. Mus., IV, 1862, 214; Jordan, Proc. U. S. Nat. Mus., 1886, 541 (note on type.)

Cryptotomus ustus Jordan, Proc. U. S. Nat. Mus., 1886, 226; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1624.

Head 3.24 to 3.25; depth 3.08 to 3.2; D. IX, 10; A. III, 8 or 9; scales 24 or 25.

Body rather deep, compressed; the back moderately elevated; head rather short and deep, its anterior profile rather steep, convex; snout rather long and blunt, its length 2.0 to 2.44 in head; eye 5.06 to 5.15;

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*A third species, *Cryptotomus margarita* Fowler (Proc. Ac. Nat. Sci. Phila., 1917, 133), from Colon, has been described since these pages were prepared. *C. margarita* differs from both species described here in having two rows of scales on the cheeks.

mouth small, horizontal; jaws subequal; preorbital wide; anterior teeth in upper jaw enlarged, canine-like; sides of jaw usually with one or more canines curved outward and backward, these entirely wanting on one side in our smaller specimens; anterior teeth in lower jaw not larger than the lateral ones; gill-membranes broadly united, attached to the isthmus; scales large, slightly enlarged on the chest, 3 in advance of ventrals; cheeks and opercles scaly, the former with a single row; lateral line slightly interrupted posteriorly, commencing again slightly lower down on middle of caudal peduncle, the pores much branched; dorsal with 9 flexible spines; caudal fin slightly rounded; anal with 3 flexible spines, the first very small, close to the second one (easily overlooked), the soft portion of fin similar to that of the dorsal; ventrals slightly shorter than pectorals, the latter 1.65 in head.

Color of alcoholic specimens olive-gray above, pale below; some of the scales with dark bases, these often more or less grouped so as to form indistinct bars and blotches on back and sides; cheek and opercle with a large bluish area; upper lip dusky; dorsal, caudal and anal all pale, with dusky bars or spots, the membrane between the first 2 spines black; ventrals and pectorals pale; no distinct axillary spot.

We have only 2 specimens of this species, respectively, 150 and 200 mm. in length.

We have compared the types (3 specimens) of *C. beryllinus*, from Key West, Florida, ranging from 110 to 135 mm. in length, with our material and are unable to find any difference, except the absence of the lateral canines in the former. In our smaller specimen, 150 mm. long, these canines are entirely wanting on one side, while the other side has but a single small one; our large specimen, 200 mm. long, has 3 well developed canines on one side and 2 on the other. The material at hand, therefore, indicates that the lateral canines are wanting in the young, but develop with age, as is shown to be the case in *C. roseus*. More material will very probably show conclusively that *C. beryllinus* is the young of *C. ustus*.

Known from South Carolina south to Brazil. Our specimens are from the Colon market.

530. **Cryptotomus roseus** Cope.

Cryptotomus roseus Cope, Trans. Amer. Philo. Soc. Phila., XIV, 1871, 462 (St. Martins); Jordan, Proc. U. S. Nat. Mus., 1886, 228 (note on type); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1626.

Head 3.15 to 3.47; depth 4.1 to 4.3; D. IX, 10; A. III, 9; scales 22 to 25.

Body slender, a little compressed; the back scarcely elevated; head low, rather long; snout abruptly pointed, slightly depressed, its length 2.75 to 3.7 in head; eye 3.85 to 4.62; mouth small, horizontal; jaws subequal; anterior teeth in upper jaw enlarged, canine-like, directed forward, separate to base, the larger specimens at hand with one or two canines in side of upper jaw, curved outward and backward, these entirely wanting in very young (specimens 50 mm. long); anterior teeth in lower jaw enlarged, more or less canine-like; no posterior canines; gill-membranes broadly united, connected with the isthmus; scales large, notably enlarged on chest, 3 scales in advance of ventrals; cheeks and opercles scaly, the former with a single row; lateral line slightly interrupted posteriorly, the pores in anterior portion much branched; dorsal with 9 very weak spines, the soft portion low; caudal slightly truncate, the lower rays a little longer than the upper ones; anal with 3 weak spines, the first one extremely small, the soft portion similar to that of the dorsal; ventrals about as long as postorbital part of head; pectorals moderate, 1.53 to 1.9 in head.

Color in spirits grayish above, pale below; fins pale; caudal with about 8 narrow dark cross-bars; pectorals with a black axillary spot. Our specimens entirely without cross-bars; very young with a narrow, pale streak, extending from above base of pectorals to base of caudal.

This species is represented in the present collection by 5 specimens, ranging in length from 50 to 85 mm. We have also examined 2 specimens, respectively 85 and 110 mm. in length, from Bahia, Brazil.

The presence of free lateral canines appears to be an age character. Our smallest specimens, 50 mm. in length, are entirely without them; specimens 60 and 65 mm. long have them slightly developed. When the fish reaches a length of 80 mm. they have become quite evident. In other respects our smallest specimens agree perfectly with the larger ones.

Known from the West Indies south to Brazil. Our specimens are from Fox Bay, Colon.

194. Genus **Scarus** Forskål.

Scarus Forskål, Descr. Animal., 1775, 25 (type *Scarus psittacus* Forskål).

Calliodon Bloch & Schneider, Syst. Ichth., 1801, 312 (type *Calliodon lineatus* Bloch & Schneider).

Hemistoma Swainson, Nat. Hist. & Class. Fish., II, 1839, 226 (type *Scarus pepo* Bennett = *Hemistoma reticulata* Swainson).

Eyrchthys Swainson, Nat. Hist. & Class. Fish., II, 1839, 226 (type *Labrus croicensis* Bloch).

Chlorurus Swainson, Nat. Hist. & Class. Fish., II, 1839, 227 (type *Scarus gibbus* Rüppell).

Body rather robust, compressed; head rather short and deep; snout blunt; upper lip laterally double, the inner fold becoming very narrow or disappearing anteriorly; lower jaw included; teeth in the jaws fully coalesced, forming continuous plates; each jaw with an evident median suture; free canines present or wanting; lower pharyngeals in the form of a rectangle, nearly twice as long as wide, transversely concave; upper pharyngeals separate, each with one large and one small row of teeth; gill-membranes scarcely united to the isthmus; scales large, 22 to 26 in a lateral series; lateral line interrupted posteriorly, commencing again lower down on caudal peduncle, the tubes more or less branched; dorsal fin constantly with 9 flexible spines and 10 soft rays; anal with 3 flexible spines, the first one very small, hidden in the skin, therefore easily overlooked, soft rays constantly 9 in number.

KEY TO THE SPECIES.

a. Upper jaw with 1 to 4 free canines posteriorly near angle of mouth.

b. Posterior canines 1 or 2.

c. Sides with a wide yellowish longitudinal band extending from eye backward, becoming indistinct on posterior part of body; caudal fin with alternating green and yellowish longitudinal streaks; dorsal mesially orange, with one or two rows of green spots. *punctulatus,* p. 737.

cc. Sides plain brownish, no longitudinal bands; caudal plain brownish, the outer rays darker in spirits, bluish green in life; dorsal without spots. *noyesi,* p. 738.

bb. Posterior canines 3 or 4; color uniformly brownish; fins pale and plain. *trispinosus,* p. 739.

aa. Upper jaw without canines.

d. Cheeks with 2 rows of 5 or 6 scales each, and a third partial row with 1 to 4 scales.

e. The scales in the upper row on cheeks much larger than those in the second row; third row with 1 or 2 scales. *cœruleus,* p. 739.

ee. The scales in the upper 2 rows of about equal size.

f. The third, or partial row, with 3 or 4 scales; sides with 2 brown longitudnial bands. *croicensis*, p. 741.

ff. Third row with only one small scale; sides without bands. *azureus* sp. nov., p. 742.

dd. Cheeks with 3 rows of 6 or 7 scales each, and a third or partial row with 2 small scales; color very dark brown or black above, of a lighter brown below; no stripes or bars present. *nigrescens* sp. nov., p. 743.

531. Scarus punctulatus (Cuvier & Valenciennes).

Scarus punctulatus Cuvier & Valenciennes, Hist. Nat. Poiss., XIV, 1839, 195 (Martinique); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1645.

Scarus diadema Cuvier & Valenciennes, Hist. Nat. Poiss., XIV, 1839, 198 (Martinique).

Pseudoscarus tæniopterus Günther, Cat. Fish. Brit. Mus., IV, 1862, 226 (Trinidad; not of Desmarest).

Pseudoscarus punctulatus Guichenot, Mém. Soc. Sci. Nat. Cherbourg, XI, 1865, 26.

Scarus tæniopterus Jordan, Proc. U. S. Nat. Mus., 1886, 47.

Head 2.8 to 3.3; depth 2.62 to 3.0; D. IX, 10; A. III, 9; scales 24 or 25.

Body moderately elongate, compressed; the back elevated; dorsal profile anteriorly gently convex; dorsal outline more strongly convex than the ventral; head moderate; snout very blunt, with a small fleshy pad on its upper surface, its length 2.35 to 2.57 in head; eye 5.0 to 6.1; mouth small, not reaching half way to eye; lower jaw included; teeth fully coalesced, forming continuous plates; each jaw with an evident median suture; upper jaw with one or two free canines posteriorly near angle of mouth; gill-membranes scarcely connected; scales large, not reduced on chest, 5 in advance of ventrals; head largely scaly; cheeks with 2 rows of 6 scales each and a third row with 3 scales, those of the upper row scarcely larger than in the next row; lateral line interrupted under posterior rays of dorsal, reappearing lower down on caudal peduncle, most of the pores more or less branched; dorsal spines flexible, each with a fleshy tip, not much different from the soft rays; caudal slightly rounded, without produced angles in specimens at hand; anal with 3 flexible spines, the first one very small, often overlooked, the soft portion similar to that of the dorsal; ventrals moderate, shorter than pectorals, the latter 1.3 to 1.45 in head.

Color dark brown above, becoming reddish to olivaceous on sides and below; a yellow longitudinal band from eye backward, becoming indistinct and disappearing posteriorly, narrow on head, a brown stripe, about as wide as eye below it, bordered above and below by green stripes, extending forward, one above the eye and the other below it, the upper one meeting its fellow on forehead and the lower one meeting its fellow on the upper lip; lower jaw with a green band extending from slightly back of angle of mouth to opposite side; lower part of head with several bright green blotches, at least along margin of opercle; dorsal and anal each with dark green bases and margins, mesially orange, with one or two rows of greenish spots of different sizes; in one specimen the anal with but a single row of round spots; outer rays of caudal deep green, the rest of fin with more or less distinct alternating green and yellowish longitudinal stripes; ventrals pale green; pectorals pale yellowish, the axil not dusky; teeth pale.

Only 2 specimens of this species, 175 and 185 mm. in length, were secured.

Known from the West Indies to Panama. Our specimens are from Porto Bello. The species was previously recorded only from the West Indies.

532. Scarus noyesi Heller & Snodgrass.

Scarus noyesi Heller & Snodgrass, Proc. Wash. Ac. Sci., V, 1903, 206, Pl. IX (Albemarle Id.).

Callyodon noyesi Snodgrass & Heller, Proc. Wash. Ac. Sci., VI, 1904 (1905), 397; Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 142 (Panama Bay).

Head 2.9; depth 2.16; D. IX, 10; A. III, 9; scales 25.

Body rather deep, compressed; the back considerably elevated; dorsal outline more strongly convex than the ventral; profile from snout to dorsal about evenly convex; head short and deep; snout long, not very blunt, its length 2.0 in head; eye 7.7; mouth rather small, reaching scarcely half way to eye; lower jaw included; teeth fully coalesced, forming continuous plates, each jaw with a distinct median suture; upper jaw with 2 posterior, conical canines, directed outward; gill-membranes nearly separate; scales large, not much reduced on chest, 5 in advance of ventrals; most of head scaly; cheeks with 2 rows of 6 scales each and a third row with 3 scales, those of the upper rows of about equal size; lateral line interrupted under posterior rays of dorsal, beginning again lower down on caudal peduncle, the pores variously branched; dorsal fin with 9 flexible spines, the spines and soft rays of about equal length, the last rays slightly longer than the rest; caudal deeply concave, the angles much produced, especially the upper one; anal with 3 spines, first one hidden in the skin (easily overlooked), the soft portion similar to that of the dorsal; ventrals moderate, shorter than the pectorals, the latter 1.34 in head.

Color in alcohol uniform brownish, scarcely paler below than above; a yellowish band extending from back of angle of mouth downward and forward across chin; dorsal and anal each with dark base and margin; caudal brownish, the outer rays darkest; ventrals plain brownish; pectorals dusky, with a wide, pale margin; teeth pale.

This species was not taken by us. It is here described from a single large specimen 515 mm. in length from Panama Bay, taken by the Albatross, either at Perico Island or Panama and recorded by Kendall & Radcliffe (Memoir. Mus. Comp. Zoöl., XXXV, 1912, p. 142).

Known from Panama south to the Galapagos Islands.

533. Scarus trispinosus Cuvier & Valenciennes.

Scarus trispinosus Cuvier & Valenciennes, Hist. Nat. Poiss., XIV, 1839, 182 (Brazil); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1648.

Scarus quadrispinosus Cuvier & Valenciennes, Hist. Nat. Poiss., XIV, 1839, 197 (Martinique); Guichenot, Mém. Soc. Sci. Nat. Cherbourg, XI, 1865, 27 (note on type).

Pseudoscarus trispinosus Guichenot, Mém. Soc. Sci. Nat. Cherbourg, XI, 1865, 23 (note on type).

Pseudoscarus quadrispinosus Jordan, Proc. U. S. Nat. Mus., 1886, 542 (note on type).

Snout rather long; upper jaw with 3 or 4 posterior canines; cheeks with 2½ to 3 rows of scales. Color of dry skin brownish; fins apparently plain and pale; no axillary spot; teeth pale.

Known to us only from meager descriptions of dried skins.

Recorded from Martinique and Brazil.

534. Scarus cœruleus (Bloch).

Corphycæna cærulea Bloch, Naturg. Ausl. Fische, II, 1786, 148, Pl. CLXXVI (in part; after Catesby and a figure of Aubriet, altered from a figure by Plumier).

Scarus loro Bloch & Schneider, Syst. Ichth., 1801, 288 (after *Loro* of Parra).

Scarus cœruleus Bloch & Schneider, Syst. Ichth., 1801, 288 (after Catesby and *Trompa* of Parra); Jordan, Rept. U. S. Fish Comm., XV, 1887(1891), 686; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1652, Pl. CCXLIV, fig. 613, jaws.

Scarus trilobatus Lacépède, Hist. Nat. Poiss., IV, 1803, 21 (Martinique; on a drawing by Plumier).

?Sparus holocyaneos Lacépède, Hist. Nat. Poiss., IV, 1803, 45 (Martinique; on a copy by Aubriet of a drawing of Plumier).

Scarus obtusus Poey, Memorias, II, 1860, 217 (Cuba; adult).

Scarus nuchalis Poey, Memorias, II, 1860, 220 (Cuba; young).

Pseudoscarus chloris Günther, Cat. Fish. Brit. Mus., IV, 1862, 227 (not *Scarus chloris* Bloch & Schneider).

Pseudoscarus cæruleus Günther, Cat. Fish. Brit. Mus., IV, 1862, 227.

Pseudoscarus nuchalis Poey, Syn. Pisc. Cub., 1868, 348.

Pseudoscarus obtusus Poey, Syn. Pisc. Cub., 1868, 349.

Head 3.16 to 3.6; depth 2.85 to 3.2; D. IX, 10; A. III, 9; scales 24 to 26.

Body elongate, moderately compressed; the dorsal outline more strongly convex than the ventral; head not much longer than deep; snout very blunt, with a well developed fleshy pad on its upper surface, its length 2.34 to 2.7 in head; eye 5.15 to 6.4; mouth small, reaching about half way to eye; lower jaw included; teeth fully coalesced, forming continuous plates; each jaw with a very evident median suture; no free canines; gill-membranes slightly connected; scales large, not much reduced on chest, 5 in advance of ventrals; most of head scaly; cheeks with 2 rows of 6 scales each, and a third row with one or two scales, those on the upper row much larger than those on the second row; lateral line interrupted under posterior rays of dorsal, beginning again lower down on caudal peduncle, the pores more or less branched; dorsal with 9 flexible spines, each with a fleshy tip, not much different from the soft rays; caudal notably concave in adult, with the angles produced; anal spines 3, the first one very small (often overlooked), weak and flexible like those of the dorsal; ventrals moderate, not much shorter than the pectorals, the latter 1.32 to 1.57 in head.

Color dark green to slightly grayish green above, becoming of a lighter shade on sides and below; no stripes or bars of any kind visible on our preserved specimens; lips a deep blue green; dorsal and anal very deep blue green, almost black, each with bright green margin; caudal slightly paler, the outer rays bright green; ventrals and pectorals mostly greenish, the latter without a black axillary spot; teeth white.

Of this species only 3 specimens, ranging from 275 to 300 mm. in length, were secured. We have compared these with specimens from the West Indies.

Known from Maryland southward to Trinidad. Our specimens are from the Colon market and Porto Bello.

535. Scarus croicensis Bloch.

Scarus croicensis Bloch, Naturg. Ausl. Fische, IV, 1790, 27, Pl. CCXXI (St. Croix); Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1882 (1883), 938; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1650; Breder, Zoologica, IV, Pt. 4, 1925, 156 (Caledonia Bay).

Scarus insulæ-sanctæ-crucis Bloch & Schneider, Syst. Ichth., 1801, 285 (St. Croix; after Bloch).

Calliodon lineatus Bloch & Schneider, Syst. Ichth., 1801, 312, Pl. LXII, fig. 2 (after Gronow).

Erychthys croicensis Swainson, Nat. Hist. & Class. Fish., II, 1839, 226 (name only).

Scarus alternans Cuvier & Valenciennes, Hist. Nat. Poiss., XIV, 1839, 200 (Martinique).

Pseudoscarus sanctæ crucis Günther, Cat. Fish. Brit. Mus., IV, 1862, 226.

Pseudoscarus lineolatus Poey, Repertorio, II, 1868, 375 (Cuba).

Scarus sanctæ-crucis Cope, Trans. Amer. Philo. Soc. Phila., XIV, 1871, 461.

?Scarus croicensis Starks, Leland Stanford Jr. Univ. Pub., Univ. Ser., 1913, 61 (Natal, Brazil).

Head 2.9 to 3.3; depth 3.1 to 3.65; D. IX, 10; A. III, 9; scales 22 to 25.

Body elongate, compressed; the back moderately elevated; dorsal profile anteriorly gently convex; dorsal and ventral outlines about evenly curved; head moderately elongate, compressed; snout rather blunt, a fleshy pad on its upper surface more or less developed, its length 2.84 to 3.6 in head; eye 3.6 to 4.85; mouth small, not reaching half way to eye; lower jaw slightly included; teeth fully coalesced, forming continuous plates; each jaw with an evident median suture; canines wanting; gill-membranes slightly united; scales large, not notably reduced on chest, 5 in advance of ventrals; head largely scaly; cheeks with 2 rows of 6 scales each, and a third row with 3 or 4 scales, those of the upper row scarcely larger than those of the second row; lateral line interrupted under posterior rays of dorsal, reappearing lower down on caudal peduncle, the anterior pores branched; dorsal with 9 flexible spines, the soft rays slightly higher than the spines; caudal slightly rounded, the angles not produced; anal spines quite as weak as those of the dorsal; ventrals moderate, slightly shorter than pectorals, the latter 1.35 to 1.78 in head.

Color in spirits brown above, pale or pale brown below; sides with 2 brown longitudinal bands, the upper one from eye to upper base of caudal, the lower one from base of pectoral to lower base of caudal; abdomen on each side with 3 narrow, pale lines; breast with similar stripes, but less distinct; fins all plain; pectoral without dark blotch at base; teeth pale.

Of this species we have 31 specimens, ranging from 30 to 65 mm. in length.

Known from Key West southward to Natal, Brazil. Our specimens are from Toro Point; Fox Bay, Colon; and Porto Bello.

536. Scarus azureus sp. nov. (Plate LXXII, fig. 1.)

Type No. 81778, U. S. N. M.; length 205 mm.; Panama City, Panama.

Head 3.36; depth 2.85; D. IX, 10; A. III, 9; scales 24.

Body moderately elongate, compressed; dorsal and ventral outlines about evenly convex; profile over snout straight, from eyes to dorsal very gently convex; head rather deep, compressed; snout blunt, with a moderately developed fleshy pad on its upper surface, its length 2.6 in head; eye 5.55; mouth small, reaching less than half way to eye; lower jaw included; teeth fully coalesced; each jaw with a very evident median suture; free canines wanting; gill-membranes separate; scales large, not much reduced on chest, 5 in advance of ventrals; head largely scaly; cheeks with 2 rows of 6 scales each, and a third row with one small scale, those of the upper rows of about equal size; lateral line interrupted under posterior rays of dorsal, beginning again lower down on caudal peduncle; dorsal fin with 9 flexible spines, each with a fleshy tip, of about the same length as the soft rays; caudal fin with its posterior margin nearly straight, the upper rays very slightly produced, forming a sharp angle, the lower lobe rounded; anal with 3 spines, the first one very small, hidden in the skin (easily overlooked), the soft portion similar to that of the dorsal; ventrals moderate, only slightly shorter than the pectorals, the latter 1.35 in head.

Color in alcohol plain grayish above, paler below; in life bluish, the margin of scales on back and sides yellowish; a blue bar across forehead from eye to eye, thence backward, soon becoming indistinct; another blue band extending from underneath eye to angle of mouth, thence

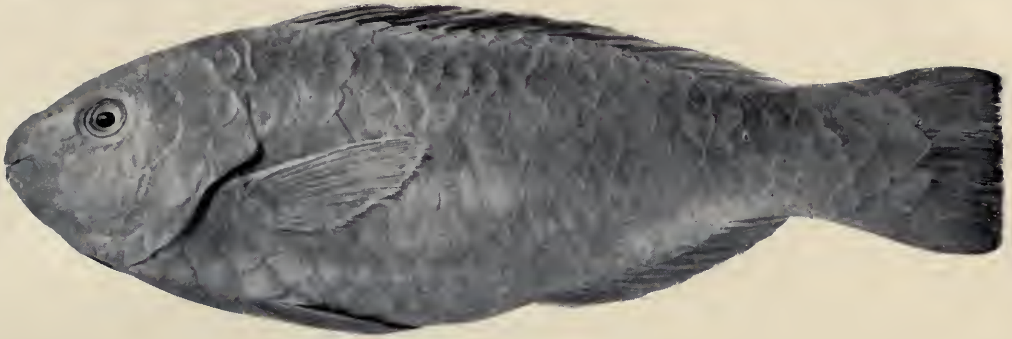

FIG. 1. SCARUS AZUREUS sp. nov.
From the type 205 mm. in length.

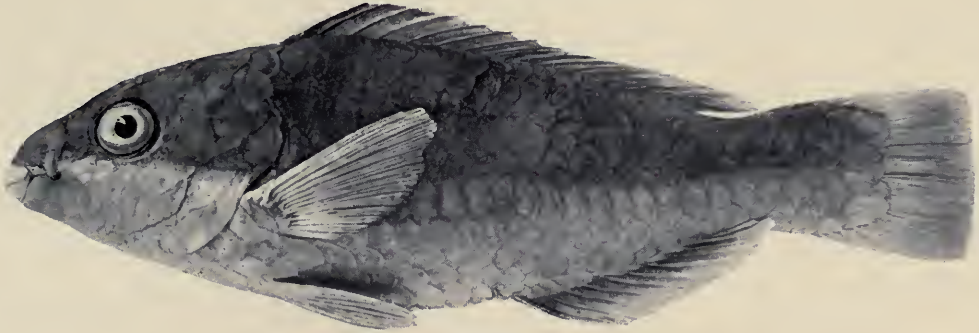

FIG. 2. SCARUS NIGRESCENS sp. nov.
From the type 105 mm. in length.

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forward around tip of snout; a third blue band from back of angle of mouth downward and forward across chin; dorsal and anal each brick-red, with a narrow blue streak at base and on margin, caudal pinkish, with upper and lower rays and posterior margin sky-blue; ventrals pinkish; pectorals yellow, upper ray sky-blue; teeth pale.

A single specimen, 205 mm. in length, purchased in the Panama City market, is present in the collection.

It differs from *S. noyesi,* the only other species of this genus recorded from the west coast of Panama, chiefly in the absence of free canines, and in the arrangement of the scales on the cheeks.

537. Scarus nigrescens sp. nov. (Plate LXXII, fig. 2.)

Type No. 81764, U. S. N. M.; length 105 mm.; Porto Bello, Panama.

Head 2.9; depth 3.25; D. IX, 10; A. III, 9; scales 25.

Body elongate, moderately compressed; the back not greatly elevated; profile slightly concave above snout, from thence to origin of dorsal gently convex; head rather long and low, compressed; snout moderately pointed, its length 2.5 in head; eye 4.62; mouth small, reaching less than half the distance to eye; lower jaw slightly included; teeth fully coalesced; each jaw anteriorly with a very distinct median suture; no free canines; gill-membranes scarcely connected; scales large, not reduced on chest, 5 in advance of ventrals; head mostly scaly; cheeks with 3 rows of 6 or 7 scales each, and a fourth row with only 2 small scales, those of the upper row not much larger than those of the next two rows; lateral line interrupted under or slightly back of base of last ray of dorsal, reappearing lower down on caudal peduncle, some of the pores slightly branched; dorsal with 9 flexible spines, of about equal length, not much different from the soft rays; caudal very slightly rounded; anal with 3 weak spines, the first one very small, the soft portion similar to that of the dorsal; ventrals moderately developed, somewhat shorter than the pectorals, the latter 1.42 in head.

Color in spirits very dark brown or nearly black above, this color changing abruptly to a lighter brown on a straight line drawn from a little above base of pectoral to middle of base of caudal; the lower surface of head and chest pale brown; body and fins entirely without spots or bars; dorsal and caudal nearly black; anal somewhat paler; ventrals slightly dusky; pectorals plain or translucent; teeth pale.

We have a single example of this species, 105 mm. in length, taken at Porto Bello.

This fish appears to differ from all other species of this genus in the very dark, and plain coloration. The scaling of the cheeks at once separates it from all other species in which the free posterior canines are wanting. In general appearance it resembles *S. cuzamilæ,* known only from Cozumel Island, but it of course lacks the posterior canines present in that species, and it has but 2 very small scales in the fourth row on the cheeks, while in *S. cuzamilæ* the fourth row is composed of 4 scales which are not much smaller than those of the rows above.

195. Genus **Pseudoscarus** Bleeker.

Pseudoscarus Bleeker, Versl. Ak. Amsterdam, XII, 1861, 230 (type *Pseudoscarus microrrhinos* Bleeker).

Loro Jordan & Evermann, Rept. U. S. Fish Comm., XXI, 1895 (1896), 418 (type *Scarus guacamaia* Cuvier).

Teeth in the jaw deep green or blue, fully coalesced; each jaw anteriorly with a very evident median suture. Other characters as in *Scarus.*

KEY TO THE SPECIES.

a. Cheeks with 2 rows of 5 or 6 scales each, and a third row with one or occasionally 2 scales; fin spines enveloped in a rather thin coat of skin; caudal fin slightly double concave in adult, the angles produced. *guacamaia,* p. 744.

aa. Cheeks with only 2 rows of 6 scales each; fin spines enveloped in a very heavy coat of skin; caudal fin slightly rounded at all ages, the angles never produced. *perrico,* p. 745.

538. **Pseudoscarus guacamaia** (Cuvier).

Guacamaya Parra, Desc. Piezas de Hist. Nat., 1787, 54, Pl. XXVI (Cuba).

Scarus guacamaia Cuvier, Règne Animal, Ed. II, II, 1829, 265 (no description; based on Parra).

Scarus turchesius Cuvier & Valenciennes, Hist. Nat. Poiss., XIV, 1839, 181 (Porto Rico).

Scarus rostratus Poey, Memorias, II, 1860, 221 (Havana).

Pseudoscarus turchesius Poey, Repertorio, I, 1866, 317.

Pseudoscarus rostratus Poey, Syn. Pisc. Cub., 1868, 349.

Pseudoscarus guacamaia Günther, Cat. Fish. Brit. Mus., IV, 1862, 233; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1657, Pl. CCXLVI, fig. 617.

Hemistoma guacamaia Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1882 (1883), 607.

Head 2.9 to 3.3; depth 2.3 to 2.8; D. IX, 10; A. III, 9; scales 23 to 25.

Body elongate, compressed; the back moderately elevated; profile slightly depressed over and in front of eyes, no trace of a fleshy pad on head; head moderately elongate; snout more pointed than in *P. perrico,* its length 2.1 to 2.9 in head; eye 4.55 to 6.8; mouth small, its posterior angle slightly nearer eye than tip of snout; jaws subequal; teeth on lower jaw included; teeth fully coalesced, forming continuous plates, with a very evident median suture; no free canines; gill-membranes slightly connected across isthmus; scales large, those on chest of about the same size as those on sides, 5 in advance of ventrals; cheeks and opercles scaly, the former with 2 rows of 5 or 6 scales each and a third row represented by one and occasionally by 2 scales; lateral line interrupted under posterior rays of dorsal, reappearing lower down on middle of caudal peduncle, most of the pores branched; dorsal fin with 9 flexible spines, each enveloped in a rather thin coat of skin, the soft rays slightly longer than the spines; caudal evenly rounded in young, slightly double concave in adult, with the angles produced; anal with 3 spines, the front one very small, often overlooked, the soft portion similar to that of dorsal; ventrals slightly shorter than pectorals, the latter, 1.28 to 1.6 in head.

Color in spirits olive brown to dark brown, paler below; dorsal with more or less distinct dusky spots, and a bluish margin; caudal more or less dusky, darker toward margin; anal dusky, with dark green margin; ventrals mostly pale, sometimes with faint brownish spots; pectorals bluish brown; teeth very dark green.

Of this species 5 specimens were secured, the smallest 95 and the largest 220 mm. in length. We examined other specimens from Key West, Florida; St. Thomas; Jamaica; and Cozumel. The largest specimen seen was 370 mm. in length.

Ranging from the Florida Keys south to Rio de Janeiro. Our specimens are from Fox Bay and tide pools, Colon, and from the Colon market.

539. **Pseudoscarus perrico** (Jordan & Gilbert).

Scarus perrico Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881, 357 (Mazatlan).

Pseudoscarus perrico Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1658; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV,

1904, 146; Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 410 (Panama).
Callyodon perrico Snodgrass & Heller, Proc. Wash. Ac. Sci., VI, 1904 (1905), 397; Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 141.

Head 2.9 to 3.2; depth 2.44 to 2.85; D. IX, 10; A. III, 9; scales 23 to 25.

Body elongate, compressed; the back moderately elevated; anterior profile evenly convex in young, adult with a fleshy pad above and back of eyes, this variously developed, not of like size in specimens of same length; head rather deep, compressed; snout blunt, its length 2.0 to 2.45 in head; eye 6.2 to 8.4; mouth small, its posterior angle about midway between tip of snout and eye; jaws subequal; teeth on lower jaw slightly included; teeth fully coalesced, forming continuous plates, with a very evident median suture; no free canines; gill-membranes very slightly connected across isthmus; scales large, those on chest of about the same size as those on sides; 5 in advance of ventrals; cheeks and opercles scaly, the former with 2 rows, each row with about 6 scales; lateral line interrupted under posterior rays of dorsal, reappearing lower down on middle of caudal peduncle, the pores much branched; dorsal fin with 9 flexible spines, each enveloped in a heavy coat of skin, the soft rays of about the same height as the spines; caudal fin slightly rounded at all ages, the angles never produced; anal with 3 spines, enveloped in a heavy coating of skin, the first one very small, often overlooked, the soft portion similar to that of dorsal; ventrals somewhat shorter than pectorals, with 2 scales between their bases; pectorals moderate, 1.33 to 1.47 in head.

Color olivaceous brown; scales in life with central portion blue, surrounded by brown; large irregular blue spots on sides of head about eyes; dorsal fin brownish, with blue margin, and an imperfect bluish streak most distinct posteriorly; caudal brownish in spirits, green in life; anal deep blue green; ventrals pale green; pectorals brownish green; teeth pea-green.

There are 4 specimens of this species in the present collection, which range in length from 240 to 465 mm.

This species is closely related to *P. guacamaia* from the Atlantic coast, differing, however, from the latter in having but 2 rows of scales on the cheeks, and in having a rounded caudal at all ages. The teeth appear to be of a paler green, and the fin spines bear a much heavier coat of skin. In all the specimens of *P. guacamaia* examined there is not a trace of a fleshy hump on the head, while all the specimens of

P. perrico, at hand, have it more or less developed, sometimes becoming very large.

Known from Mazatlan south to the Galapagos Islands. Our specimens were purchased in the Panama City market.

196. Genus **Sparisoma** Swainson.

Sparisoma Swainson, Nat. Hist. & Class. Fish., II, 1839, 227 (type *Sparus abildgaardi* Bloch).

Euscarus Jordan & Evermann, Rept. U. S. Fish Comm., XXI, 1895 (1896), 416 (type *Labrus cretenses* Linnæus).

Body elongate, compressed; head rather short and deep; snout usually blunt; upper lip double for its entire length; upper jaw included; teeth in the jaws coalesced, forming continuous plates; each jaw with an evident median suture; free canines present or wanting; lower pharyngeals much broader than long, the surface flat or concave; upper pharyngeals separate, each with 3 rows of teeth; gill-membranes united with the broad isthmus; scales large, 24 to 26 in a lateral series; lateral line interrupted posteriorly, beginning again lower down on caudal peduncle, the pores always more or less branched; dorsal fin with 9 pungent spines, and 10 soft rays; anal with 3 weak spines, and 9 soft rays.

KEY TO THE SPECIES.

a. Upper jaw with one or more free lateral canines on each side above the cutting edge of the dental plates. (These normally present, at least in adult.)

b. General color of body dark red or brown; no pale streaks along sides; scales along back with black edges; margin of opercles black. *abildgaardi,* p. 748.

bb. Color paler, reddish brown or greenish; scales along back without black edges; margin of opercles not black.

c. Pectorals without a black spot at base of upper rays.

d. Snout moderately pointed, its upper profile straight; interorbital space transversely flat or slightly concave; lateral canines one on each side, wanting in young; general color reddish brown; sides usually with 2 longitudinal pale streaks, these most distinct in young. *distinctum,* p. 749.

dd. Snout very blunt, its upper profile convex; interorbital space transversely convex; upper jaw usually with more than one lateral canine on each side; general color greenish; sides occasionally with a single indefinite pale streak. *radians,* p. 750.

cc. Pectorals with a very prominent jet-black spot at base of upper rays; general color of body bluish green. *chrysopterum,* p. 753.

aa. Upper jaw normally without free canines, or rarely a very small one developed on one or both sides.

e. Pectorals with a very evident jet-black spot at base of upper rays.

f. Snout very bluntly rounded, the interorbital space transversely strongly convex. *rhomaleum* sp. nov., p. 754.

ff. Snout more pointed; interorbital space transversely flat or slightly concave.

g. Body deep, rather strongly compressed, its depth 2.82 in its length; caudal fin in adult with middle rays of about equal length, the outer rays notably produced; general color in alcohol grayish. *squalidum,* p. 755.

gg. Body more elongate, its depth 3.13 in its length; caudal fin in adult about evenly concave, the outer rays not much produced; general color in alcohol greenish. *elongatum* sp. nov., p. 757.

ee. Pectorals without a black spot at base of upper rays.

h. Snout very blunt; interorbital space transversely strongly convex; general color olive-gray or brownish, occasionally with one or more pale streaks along sides; body often more or less mottled; vertical fins with spots and bars. *flavescens,* p. 758.

hh. Snout more pointed; interorbital space flat; color nearly uniformly bluish violet. *frondosum,* p. 759.

540. Sparisoma abildgaardi (Bloch).

Sparus abildgaardi Bloch, Naturg. Ausl. Fische, V, 1791, 22, Pl. CCLIX (America; from a specimen sent by Prof. Abildgaard).

Scarus coccineus Bloch & Schneider, Syst. Ichth., 1801, 289 (Cuba).

Sparus aureoruber Lacépède, Hist. Nat. Poiss., IV, 1803, 56, 163 (Martinique; on a drawing by Plumier).

Sparisoma abildgardii Swainson, Nat. Hist. & Class. Fish., II, 1839, 227.

Scarus amplus Ranzani, Novi Comment. Ac. Sci. Inst. Bonon., V, 1842, 324, Pl. XXV (Brazil).

Scarus erythrinoides Guichenot, Mém. Soc. Sci. Nat. Cherbourg, XI, 1865, 10 (San Domingo).

Scarus oxybrachius Poey, Syn. Pisc. Cub., 1868, 342 (Cuba).

Sparisoma abildgaardi Jordan, Rept. U. S. Fish Comm., XV, 1887 (1891), 676; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1635; Evermann & Marsh, Bull. U. S. Fish Comm., XX, Pt. I, 1900 (1902), 239 (Porto Rico).

Head 2.85 to 3.3; depth 2.54 to 2.9; D. IX, 10; A. III, 9; scales 24 or 25.

Body elongate, rather strongly compressed; the back elevated; profile from snout to posterior margin of eyes nearly straight; head deep, compressed; snout moderately pointed, its length 2.0 to 2.5 in head; eye 4.35 to 6.4; interorbital space flat; mouth small; upper jaw included; teeth coalesced, the cutting edge more or less uneven, median suture evident; a small canine above cutting edge of upper jaw, near angle of mouth, usually present; gill-membranes united with the broad isthmus; scales large, 3 in advance of ventrals; cheek and opercle scaly, the former with a single row of 5 scales; lateral line interrupted posteriorly, beginning again on next row of scales below, the pores much branched; dorsal fin with 9 pungent spines, all of about the same length as the soft rays; caudal fin deeply concave in large specimens, with the angles produced, much less so in smaller individuals, probably rounded in young; anal with 3 weak spines, the soft portion similar to that of the dorsal; ventrals moderate, not much shorter than the pectorals, the latter 1.19 to 1.38 in head.

Color in alcohol brown above, paler below; each scale along back and upper portion of sides with a dark brown margin; lips and margin of opercle dark brown; dorsal and caudal brownish; other fins pale; no black spot at base of pectorals. The life colors of a large specimen from Porto Rico are described thus: "Fins and lower parts below a line from tip of under jaw to base of caudal under the end of lateral line, red, edges of scales paler; body above grayish, edges of scales black, bases of those below lateral line rosy; brownish-red wavy stripes radiating from eye below; oblique pale-blue stripes on dorsal, tips of row of smaller scales at base of anal blue, and 3 blotches on upper and 3 on lower ray of caudal; a few scales at base of caudal with pale yellow; iris yellow, pupil bordered narrowly with red; membranous edge of opercle black." (Evermann & Marsh, Bull. U. S. Fish Comm., XX, Pt. I, 1900 (1902), p. 239.)

This species was not taken by us. It is recorded from the West Indies and Brazil, but not from Panama. It is here described from 5 specimens, ranging from 200 to 360 mm. in length, from the West Indies.

541. **Sparisoma distinctum** (Poey).

Scarus distinctus Poey, Memorias, II, 1861, 423 (Havana).

Sparisoma distinctum Jordan, Rept. U. S. Fish Comm., XV, 1887

(1891), 676; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1635.

Head 3.2 to 3.5; depth 2.7 to 3.0; D. IX, 10; A. III, 9; scales 24 or 25.

Body elongate, compressed; the back elevated; profile from tip of snout to posterior margin of eyes straight, from thence to dorsal slightly convex; head rather short; snout moderately pointed, its length 2.3 to 3.0 in head; eye 3.5 to 5.0; interorbital space transversely flat or slightly concave; mouth small; upper jaw included; teeth coalesced, the cutting edges more or less uneven, median suture evident; upper jaw usually with a single canine above the cutting edge near angle of mouth, and sometimes with one or more small points in front on edges of median suture; gill-membranes united with the isthmus; scales large, 3 in advance of ventrals; cheeks and opercles scaly, the latter with a single row of 5 scales; lateral line interrupted posteriorly, beginning again on next row of scales below, the pores with several branches; dorsal with 9 pungent spines, all of about the same length as the soft rays; caudal fin slightly rounded in very young, becoming slightly concave with age, the outer rays not prominently produced; anal with 3 weak spines, the soft portion similar to that of the dorsal; ventral fins moderate; pectorals rather long, 1.22 to 1.3 in head.

Color of old alcoholic specimens brownish above, pale below; sides with 2 pale streaks, the upper one extending from upper margin of eye to upper surface of caudal peduncle, the lower one extending from lower margin of eye to middle of base of caudal, these most distinct in young, the upper one indistinct or wanting in adult; margin of opercle and scales not black; fins unmarked; no black spot at base of upper rays of pectorals; teeth pale.

This fish was not taken by us. It is here described from specimens from Cuba, Nassau, and Biscayne Bay, Florida, ranging in length from 85 to 235 mm. Two of the specimens from Cuba are of Poey's own identification. The smallest specimen at hand is from Biscayne Bay, Florida, and is wrongly identified in the National Museum collection as *Cryptotomus beryllinus*. This appears to be the first record of this species from the U. S. coast.

Ranging from Florida south to Brazil, but not recorded from Panama.

542. **Sparisoma radians** (Cuvier & Valenciennes). (Plate LXXIII, figs. 1 & 2.)

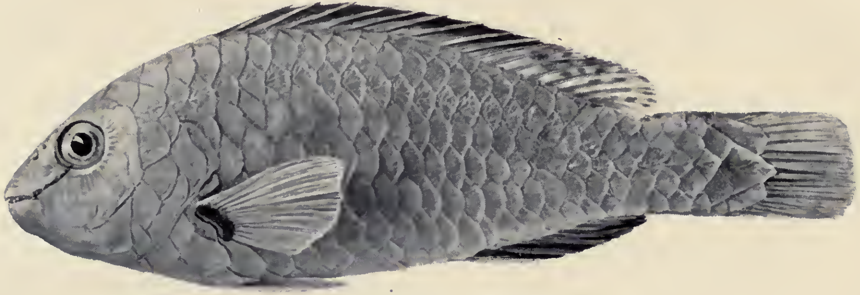

FIG. 1. **SPARISOMA RADIANS** (Cuvier & Valenciennes).
Male. From a specimen 118 mm. in length.

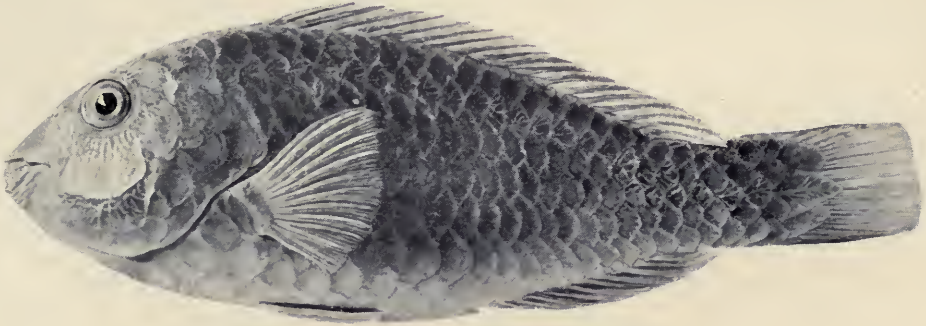

FIG. 2. **SPARISOMA RADIANS** (Cuvier & Valenciennes).
Female. From a specimen 126 mm. in length.

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Scarus radians Cuvier & Valenciennes, Hist. Nat. Poiss., XIV, 1839, 206 (Brazil); Günther, Cat. Fish. Brit. Mus., IV, 1862, 211.

Labrus radians Castelnau, Anim. Nouv. Rares Amér. Sud, 1855, 29.

Scarus lacrimosus Poey, Memorias, II, 1861, 422 (Havana).

Scarus hoplomystax Cope, Trans. Amer. Philo. Soc. Phila., XIV, 1871, 462 (St. Martins).

Sparisoma cyanolene Jordan & Swain, Proc. U. S. Nat. Mus., 1884, 98 (Key West).

Sparisoma xystrodon Jordan & Swain, Proc. U. S. Nat. Mus., 1884, 99 (Key West, Florida); Bean, Bull. U. S. Fish Comm., XV, 1888 (1900), 198; Jordan, Rept. U. S. Fish Comm., XV, 1887 (1891), 678; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1630.

Sparisoma hoplomystax Jordan, Rept. U. S. Fish Comm., XV, 1887 (1891), 677, Pl. X; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1632, Pl. CCXLIV, fig. 611; Breder, Zoologica, IV, Pt. 4, 1925, 156 (Caledonia Bay).

Sparisoma radians Jordan, Rept. U. S. Fish Comm., XV, 1887 (1891), 677; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1631.

Head 3.05 to 3.56; depth 2.6 to 2.9; D. IX, 10; A. III, 9; scales 24 to 26.

Body elongate, rather robust, compressed; the back moderately elevated; profile from snout to origin of dorsal evenly convex; ventral outline anteriorly rather strongly curved; head short and deep; snout blunt, its length 2.58 to 3.1 in head; eye 3.5 to 4.6; interorbital space convex; mouth small, failing to reach vertical from anterior margin of eye; upper jaw included; teeth in each jaw coalesced, forming continuous plates, the median suture not always very evident; upper jaw with 1 to 4 free canines on each side above its cutting ege, each individual, however, not always with the same number on both sides; gill-membranes attached to the broad isthmus; scales large, slightly enlarged on chest, 3 in advance of ventrals; cheeks and opercles scaly, the former with a single row of 5 scales; lateral line interrupted posteriorly, beginning again on next row of scales below, the pores with few or several branches; dorsal with 9 pungent spines, of about same length as soft rays; caudal rounded; anal with 3 weak spines, the first very small, hidden in the skin; ventrals moderate, slightly shorter than the pectorals, the latter 1.43 to 1.2 in head.

Color of female in spirits grayish or brownish above, paler below; chin usually crossed by a distinct whitish band; a pale streak extending from eye to base of caudal sometimes present; no bluish green streak from eye to angle of mouth; dorsal, caudal and anal all more or less spotted or barred with grayish or dusky; the membrane between the first 2 spines of dorsal black; ventrals usually plain, occasionally faintly spotted; pectorals plain greenish, their bases brown or dusky, never bluish black. The following notes were based on some fresh specimens: General color greenish olive; chest yellow, mottled with darker; sides with a light band, extending from above pectoral to caudal peduncle, where it fades into the ground color; chin with a pale band; dorsal yellowish green or red; caudal greenish yellow to red, faintly barred; anal red or yellow, more or less barred with brown; base of pectorals bluish green. The male differs from the female in being, as a rule, darker in color, and it has an evident narrow bluish green streak running from eye to angle of mouth; the white bar on chin is very faint or wanting. The fins are less spotted and barred, and the caudal and anal are often partly black. The pectorals always have a darker base, which is usually very deep bluish black. The following notes were based on a fresh male specimen, which was then thought to be a distinct species: General color greenish olive; yellow below, this color most prominent on chest; chin with a black blotch; a narrow bluish green streak from eye to angle of mouth; dorsal reddish at base, with black margin; caudal yellowish green at base, the distal fourth black; anal black; base of pectorals black; teeth pale.

Of this species there are 218 specimens, ranging from 40 to 140 mm. in length, in the present collection.

The study of our large series has made it possible to unite under one name several nominal species based chiefly on color. The dissection of 50 specimens shows that all of those with the bluish green streak from eye to angle of mouth, and with the base of pectorals bluish black are males. All of the specimens with black on caudal and anal were found to be males, although some without black on these fins were also found to be males. The female has the vertical fins more or less spotted or barred. It lacks the bluish green streak from eye to angle of mouth, and the base of the pectorals is brown, never black. There is considerable variation in color even among individuals of the same sex, and when the extremes of the opposite sexes are compared, a prominent difference appears to exist. This difference in the color of the male and female, together with the large variation among individuals of the same sex, has led to the description of several nominal species, of which *S. xystrodon* seems to represent the most highly colored male and *S. cyanolene* the most modest female.

Known from Florida south to Brazil. Our specimens are from Fox Bay, Colon, and Porto Bello. The species is abundant among eel-grass, where it was taken in company with *S. flavescens*.

543. Sparisoma chrysopterum (Bloch & Schneider).

Scarus chrysopterus Bloch & Schneider, Syst. Ichth., 1801, 286, Pl. LVII (American Seas); Günther, Cat. Fish. Brit. Mus., IV, 1862, 211.

Scarus chloris Bloch & Schneider, Syst. Ichth., 1801, 289 (Cuba).

Scarus lateralis Poey, Memorias, II, 1860, 219 (Cuba).

Sparisoma chrysopterum Jordan & Swain, Proc. U. S. Nat. Mus., 1884, 94; Jordan, Rept. U. S. Fish Comm., XV, 1887 (1891), 674; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1636; Evermann & Marsh, Bull. U. S. Fish Comm., XX, 1900 (1902), 239.

Head 3.1 to 3.3; depth 2.8 to 3.06; D. IX, 9 or 10; A. III, 9; scales 25.

Body elongate, compressed; the back elevated; profile from tip of snout to anterior margin of eyes nearly straight, from eyes to dorsal slightly convex; head deep, compressed; snout moderately pointed, 2.05 to 2.35 in head; eye 5.0 to 5.2; interorbital space flat; mouth small; upper jaw included; teeth coalesced, the cutting edges more or less uneven, the median suture evident; upper jaw with one or several canines on sides above the cutting edge, and one or two in front on edges of median suture; gill-membranes united with the broad isthmus; scales large, 3 in advance of ventrals; cheeks and opercles scaly, the former with a single row of 5 scales; lateral line interrupted posteriorly, beginning again on next row of scales below, the pores considerably branched; dorsal with 9 pungent spines, of about the same length as the soft rays; caudal fin in adult deeply concave, the outer rays much produced; anal with 3 weak spines, the soft portion similar to that of dorsal; ventrals not much shorter than the pectorals, the latter 1.4 to 1.44 in head.

Color of old alcoholic specimens at hand all faded, except a large, distinct black spot at base of upper rays of pectorals; the margin of the scales appear lighter than the rest of the scale. The life colors of a specimen, about a foot long, from Porto Rico are described by Evermann & Marsh (Bull. U. S. Fish Comm., XX, 1900 (1902), p. 239) thus: "Rich greenish-blue or bluish-green above; edges of scales greener, their bases darker; under parts rich blue; head greenish-blue, somewhat mottled; lower jaw and breast sky-blue; dorsal pale rose; anal pale blue at base, then broadly pale brick-red, then a very narrow pale-blue border; caudal reddish at base, blue on outer rays extending to tips; abaft the red a pale crescent, then a broad blood-red one, and last a narrow bluish-green border; pectoral pale lemon, a black splotch at base above; ventrals pale-greenish."

This species was not taken by us. It is here described from 3 specimens, 255 to 320 mm. in length, from the West Indies.

Ranging from the West Indies south to Brazil, but not recorded from Panama.

544. Sparisoma rhomaleum sp. nov. (Plate LXXIV, fig. 1)

Type No. 81777, U. S. N. M.; length 225 mm.; Colon market, Panama.

Head 3.33 to 3.7; depth 2.8 to 2.95; D. IX, 10; A. III, 9; scales 25.

Body elongate, robust, moderately compressed; the back elevated; dorsal profile anteriorly rather strongly convex; head short and deep; snout very blunt, its length 1.97 to 2.2 in head; eye 5.0 to 5.25; interorbital space transversely strongly convex; mouth small; upper jaw included; teeth coalesced, the cutting edge more or less uneven, the median suture evident; upper jaw with one very small point in front above cutting edge next to median suture, usually none on side (Our largest specimen has only one very small point developed near angle of mouth, on one side of jaw only); gill-membranes united with the broad isthmus; scales large, 3 in advance of ventrals; cheeks and opercles scaly, the former with a single row of 5 scales; lateral line interrupted posteriorly, beginning again on next row of scales below, the pores much branched, occupying nearly the entire row of scales; dorsal with 9 pungent spines, all of about the same length as the soft rays; caudal fin in adult about evenly concave, the outer rays not much produced; anal with 3 weak spines, the first one very small, the soft portion similar to that of the dorsal; ventral fins moderate, not much shorter than the broad pectorals, the latter 1.25 to 1.28 in head.

Color in alcohol dark green to brownish above, pale green below; sides of body perfectly plain, without spots or bars; snout mostly dusky; opercles with an indistinct bluish blotch or bar; dorsal and anal bluish black or dusky; caudal with the inner rays pale, the outer rays deep green to bluish; ventrals pale; pectorals dusky, with a wide, pale margin, and a very prominent black spot at the base of the upper rays; teeth with a greenish tinge.

We have 3 specimens of this species, respectively 225, 280 and 320 mm. in length, which were secured in the Colon market.

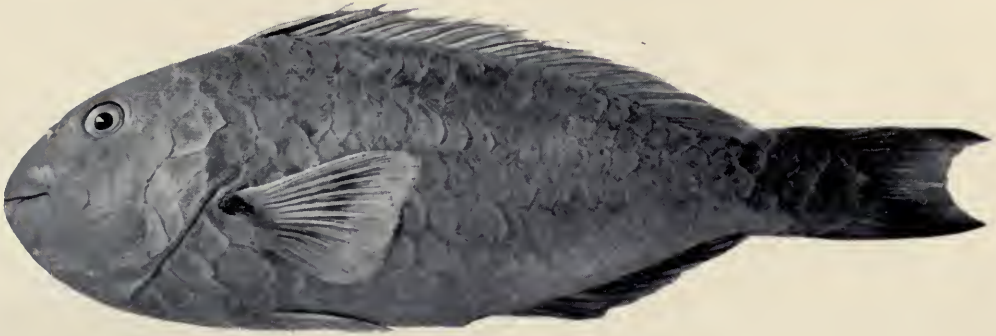

FIG. 1. SPARISOMA RHOMALEUM sp. nov.
From the type 225 mm. in length.

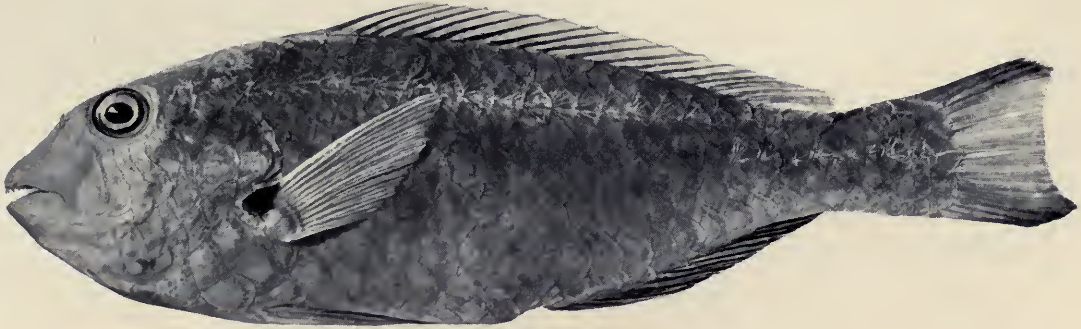

FIG. 2. SPARISOMA ELONGATUM sp. nov.
From the type 230 mm. in length.

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This fish appears to become darker in color with age. Our largest specimen has only 6 soft rays in the dorsal, which must, however, be regarded as an abnormal development, since it agrees in every other respect with the other specimens.

We are unable to identify our specimens with any known species. They agree admirably in the general shape and form of the body with *S. flavescens,* but differ very prominently from that species in color. Comparing adult specimens of like size, it is also evident that the caudal fin is much more deeply concave in the present species.

545. **Sparisoma squalidum** (Poey).

Scarus squalidus Poey, Memorias, II, 1860, 218 (Cuba); Günther, Cat. Fish. Brit. Mus., IV, 1862, 212; Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1883, 938.

Sparisoma flavescens Jordan & Swain, Proc. U. S. Nat. Mus., 1884, 92 (in part); Jordan, Rept. U. S. Fish Comm., XV, 1887 (1891), 672 (in part); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1639 (in part).

Head 3.35; depth 2.82; D. IX, 10; A. III, 9; scales 25.

Body elongate, rather strongly compressed; the back moderately elevated; profile straight or slightly concave over snout, slightly convex from anterior margin of eyes to origin of dorsal; head short, rather strongly compressed; snout rather long and pointed, its length 2.25 in head; eye 4.6; interorbital space transversely slightly concave, the skull broadened just in front of eyes; mouth small, failing to reach anterior margin of eye; upper jaw included; teeth fully coalesced, forming continuous plates, the anterior suture in each jaw quite evident; no free lateral canines; gill-membranes attached to the broad isthmus; scales large, not reduced on chest, 3 in advance of ventrals; cheeks and opercles scaly, the former with a single row of 5 scales; lateral line interrupted posteriorly, beginning again on next row of scales below; dorsal with 9 pungent spines, of about the same length as the soft rays; caudal concave, the middle rays of about equal length, the outer rays notably produced; anal with 3 weak spines, the soft portion similar to that of the dorsal; ventrals moderate, somewhat shorter than the pectorals, the latter 1.28 in head.

Color in alcohol uniform grayish olive above, pale below, probably mostly reddish in life; rows of scales on lower part of sides with pale or slightly bluish streaks; dorsal grayish, with darker spots or indistinct bars; middle rays of caudal pale, the outer rays dusky, with indistinct darker spots; anal and ventrals pale; pectorals greenish, with a very evident jet-black spot at the base of the upper rays: teeth pale.

Of this species there is a single specimen, 220 mm. long, in the present collection. In the National Museum collection there are 4 specimens from Nassau, 200 to 355 mm. in length, and 2 from Curacao, 200 and 205 mm. long, all wrongly identified as *S. flavescens,* which, however, agree perfectly with our specimen. The largest of these have the interorbital space more strongly concave, and the outer rays of caudal more prominently produced. A specimen from Cuba, 340 mm. long, identified as *S. squalidus* by Poey, agrees admirably with the original description of that species, and is quite certainly identical with our specimen. *S. squalidum* is, therefore, not identical with *S. flavescens* as considered by recent authors. It may be distinguished from the latter by the more strongly compressed head and body, more sharply pointed snout, and by the transversely flat or slightly concave interorbital. Comparing specimens of like size, a very marked difference becomes evident in the shape of the caudal fin. In *S. flavescens* the outer rays of the caudal are never as prominently produced as in the present species. The color of preserved specimens of *S. squalidum* is much paler, the fins have fewer spots and bars, and the very prominent jet-black spot at the base of the upper rays of the pectorals at once distinguish the two species.

From *S. brachiale,* a Cuban species, which *S. squalidum* strongly resembles, it is distinguished by the absence of free lateral canines. *S. brachiale* has by recent authors (Jordan & Swain, Proc. U. S. Nat. Mus., 1884, p. 93; Jordan, Rept. U. S. Fish Comm., XV, 1887 (1891), p. 673; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, p. 1641; Evermann & Marsh, Bull. U. S. Fish Comm., XX, 1900 (1902), p. 242) been erroneously described as having no free lateral canines. Poey in the original description of the type, a specimen 240 mm. long, however, states that it has such teeth, viz.: "Les dents sont blanches, ses granulations bien marquées sur le mâchoire inférieure; la supérieure a son bord crénelé, et porte en arrière deux ou trois pointes latèrales très petites." (Memorias, II, 1861, p. 345). In the National Museum collection is a specimen 300 mm. long, identified by Poey, himself, as this species, which has the canines as above described.

Ranging from the Bahamas south to Venezuela. Our specimen was obtained in the Colon market.

546. Sparisoma elongatum sp. nov. (Plate LXXIV, fig. 2.)

Type No. 81504; U. S. N. M.; length 230 mm.; Panama City, Panama.

Head 3.36; depth 3.13; D. IX, 10; A. III, 9; scales 25.

Body elongate, rather slender, moderately compressed; the back elevated; profile straight over snout, gently convex from eyes to dorsal; head rather short; snout moderately produced, its length 2.33 in head; eye 4.4; interorbital space flat; mouth small, not reaching vertical from anterior margin of eye; upper jaw included; teeth fully coalesced, forming continuous plates, the cutting edges more or less uneven, the median suture evident; upper jaw without free canines at side, and with only one minute point in front on edge of the median suture; gill-membranes connected with the isthmus; scales large, 3 in advance of ventrals; cheeks and opercles scaly, the former with a single row of 5 scales; lateral line interrupted posteriorly, beginning again on the next row of scales below, the pores with several branches occupying most of one row of scales; dorsal with 9 pungent spines, all of about the same length as the soft rays; caudal fin about evenly concave, the outer rays not much produced; anal with 3 spines, the first one very small, the soft portion similar to that of the dorsal; ventrals nearly as long as the pectorals, the latter 1.25 in head.

Color in alcohol dark green above, pale green below; no streaks of any kind on sides of body; head with a pale green streak, extending from lower margin of eye to angle of mouth, where it curves backward on lower margin of cheek; snout plain olivaceous; lips dusky; dorsal fin grayish green, without spots or bars; caudal with middle rays of white, the outer rays grayish dusky, fin margined with dusky; anal pale at base, distal portion of fin more or less dusky; ventrals pale, unmarked; pectorals pale green, with a livid green area above axil and a very prominent black spot at base of upper rays.

A single specimen of this species is present in the collection. It is 230 mm. in length, and was purchased in the Panama City market. It is the first species of this genus recorded from the Pacific coast. This fact leads one to wonder if it could have been brought across from the Atlantic coast. But inasmuch as the supply of fish on the Atlantic coast is much smaller than the demand, and that Pacific coast fish are frequently brought across to supply the Atlantic coast markets, this does not seem probable. During the two seasons spent on the Isthmus by the present writers, no Atlantic coast fish were seen, or, at any rate, recognized as such in the Panama City market. The specimen at hand was taken along with *Trachinotus rhodopus, Caranx caballus,* *Paralichthys woolmani, Ancylopsetta dendritica, Azevia panamensis,* and others, all distinctly Pacific coast fish. We, therefore, regard this record as genuine.

Our specimen is rather closely related to the Brazilian fish, *S. maschalespilos* Bleeker, from which, however, it differs in the more elongate and less strongly compressed body, in the shape of the caudal, and in color.

547. Sparisoma flavescens (Bloch & Schneider).

Scarus flavescens Bloch & Schneider, Syst. Ichth., 1801, 290 (Cuba).

Callyodon flavescens Cuvier & Valenciennes, Hist. Nat. Poiss., XIV, 1839, 289.

Sparisoma flavescens Jordan & Swain, Proc. U. S. Nat. Mus., 1884, 92 (in part); Jordan, Rept. U. S. Fish Comm., XV, 1887 (1891), 672 (in part); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1639.

Head 3.25 to 3.66; depth 2.64 to 3.2; D. IX, 10; A. III, 9; scales 24 to 26.

Body elongate, robust, moderately compressed; the back elevated; profile over snout nearly straight, from eyes to origin of dorsal gently convex; ventral outline anteriorly strongly convex; head short and deep; snout very blunt, its length 2.4 to 3.34 in head; eye 3.55 to 5.2; interorbital space transversely strongly convex; mouth small, not reaching anterior margin of eye; upper jaw included; teeth fully coalesced, each jaw with an evident median suture; no lateral canines; gill-membranes joined to the broad isthmus; scales large, slightly enlarged on breast, 3 in advance of ventrals; cheeks and opercles scaly, the former with a single row of 5 large scales; lateral line slightly interrupted posteriorly, beginning again on next row of scales below, most of the pores with several branches; dorsal with 9 pungent spines, of about the same length as the soft rays; caudal rounded in young, becoming slightly truncate in specimens about 185 mm. long, notably concave with the angles somewhat produced in adults; anal with 3 very weak spines, the soft portion similar to that of the dorsal; ventrals not much shorter than the pectorals, the latter 1.23 to 1.73 in head.

Color olive-gray to brownish above, pale to orange below; sometimes with one or more indistinct pale streaks along sides; often more or less clouded with darker blotches or bars; lower jaw brownish or dusky, crossed by a pale band; dorsal and caudal pale olivaceous, each barred and spotted with brown; anal red, with faint spots or bars of brown; ventrals nearly uniformly red, sometimes with faint brownish bars; pectorals light orange-red; teeth pale.

Of this species 156 specimens, ranging from 35 to 250 mm. in length, were preserved. It was found to be the most abundant fish along shores lined with eel-grass, nearly every seine haul yielding considerable numbers.

Known from Key West south to Rio de Janeiro. Our specimens are from Toro Point; Fox Bay, Colon; and Porto Bello.

548. Sparisoma frondosum (Cuvier).

Scarus frondosus (Cuvier MS.) Agassiz, in Spix, Pisc. Brasil., 1831, 98, Pl. LIV (Bahia); Jordan, Proc. U. S. Nat. Mus., 1886, 542 (note on the type).

Scarus aracanga Günther, Cat. Fish Brit. Mus., IV, 1862, 209 (Jamaica).

Sparisoma aracanga Jordan, Rept. U. S. Fish Comm., XV, 1887 (1891), 674.

Sparisoma frondosum Jordan, Rept. U. S. Fish Comm., XV, 1887 (1891), 673; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1642; Starks, Leland Stanford Jr. Univ. Pub., Univ. Ser., 1913, 61.

Head 3.7; depth 2.9; D. IX, 10; A. III, 9; scales 25.

Body elongate, compressed; the back elevated; profile anteriorly gently convex; ventral outline anteriorly strongly convex; head rather short; snout moderate, scarcely as blunt as in *S. flavescens,* its length 2.37 in head; eye 4.37; interorbital space transversely flat; mouth small, failing to reach anterior margin of eye; upper jaw included; teeth fully coalesced, each jaw with an evident median suture; no lateral canines; gill-membranes united with the broad isthmus; scales large, 3 in advance of ventrals; cheeks and opercles scaly, the former with a single row of 5 scales; lateral line interrupted posteriorly, beginning again on next row of scales below; dorsal with 9 pungent spines, all of about the same length as the soft rays; caudal evenly and gently concave in specimens at hand; anal with 3 weak spines, the soft portion similar to that of dorsal; ventrals not much shorter than the pectorals, the latter 1.35 in head.

Color in alcohol uniform brownish above, paler below; rows of scales on lower part of sides with pale streaks; vertical fins rather distinctly spotted and barred; ventrals and pectorals pale; no black spot at base of pectorals. The life colors have been described as nearly uniform bluish violet.

This species was not taken by us. It is here described from a single specimen, 170 mm. long, from Bahia, Brazil.

This fish differs from *S. flavescens* in the slightly more pointed snout, in the flat interorbital space and in color. Comparing the specimen at hand with a specimen of *S. flavescens* of the same size, an evident difference in the shape of the caudal is noticed. The caudal in *S. flavescens* of this size (170 mm.) is still slightly rounded, while in the present species it is evenly and gently concave.

Known from Jamaica to Brazil, but not recorded from Panama.

Family LXIII. **Ephippidæ.**

THE SPADE-FISHES.

Body very deep, much compressed; dorsal outline strongly arched, more so than the ventral; head short and blunt; mouth small, terminal, slightly protractile or not; maxillary short, no supplemental bone; nostrils double; gill-membranes broadly united with the isthmus; the rakers very short; branchiostegals 6 or 7; pseudobranchiæ present; lateral line present, strongly arched; scales small, ctenoid; dorsal fins slightly disconnected or not, the anterior with 8 to 10 spines; the soft dorsal long, densely scaled at base, anteriorly elevated, sometimes much produced; caudal fin broad, with posterior margin straight or concave; anal fin with 3 or 4 spines, the soft portion similar to that of the dorsal; ventrals thoracic, pectorals short. This is a rather small family, having a single representative on the Atlantic coast of Panama and two on the Pacific coast.

KEY TO THE GENERA.

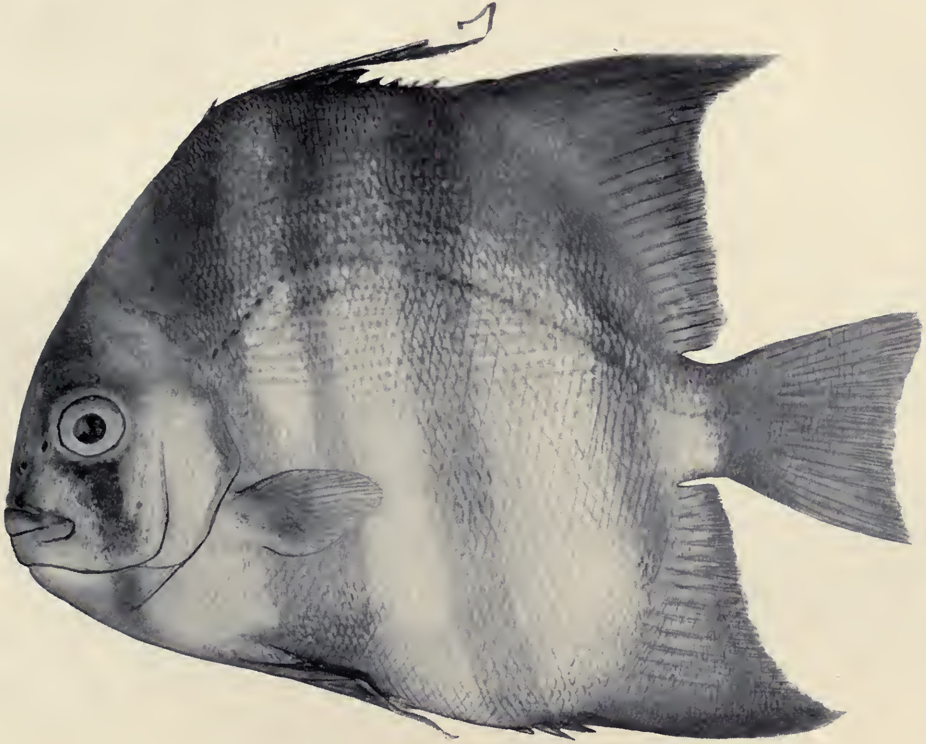
a. Dorsal spines of unequal length, the third produced; mouth slightly protractile, a distinct transverse fold above upper lip; ventral fins rather large. *Chætodipterus,* p. 760.

aa. Dorsal spines very short and of about equal length; mouth not protractile, no transverse fold above upper lip; ventral fins small. *Parapsettus,* p. 763.

197. Genus **Chætodipterus** Lacépède.

Chætodipterus Lacépède, Hist. Nat. Poiss., IV, 1803, 503 (type *Chætodipterus plumierii* Lacépède).

Body very deep, much compressed; the anterior profile very steep; head short and blunt; mouth small, terminal; teeth small, more or less



CHÆTODIPTERUS FABER (Broussonet).
From a specimen 140 mm. in length.

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flexible, in narrow bands; preopercle finely serrate or nearly smooth; branchiostegals 6; scales small, ctenoid, present nearly everywhere on head, from 50 to 100 in a lateral series; dorsal fins scarcely separate, the first with about 9 spines, the third elongate; anal with three spines, the second the longest; soft portion of dorsal and anal anteriorly elevated in adult; ventrals long, I, 5, with a large accessory scale. Two species are known, one each on the Atlantic and Pacific coasts of tropical and subtropical America.

KEY TO THE SPECIES.

a. Scales of moderate size, 50 to 60 in a lateral series, regularly arranged; dorsal spines and the anterior part of soft dorsal and anal very strongly elevated. *faber,* p. 761.

aa. Scales very small, from 75 to 100 in a lateral series, irregularly arranged; dorsal spines and the anterior part of soft dorsal and anal only moderately elevated. *zonatus,* p. 762.

549. Chætodipterus faber (Broussonet). (Plate LXXV.)

Chætodon faber Broussonet, Ichth. Sist. Pisc., 1782, (19), Pl. (VI).

Chætodon plumieri Bloch, Naturg. Ausl. Fische, III, 1787, 104, Pl. CCXI (Martinique).

Zeus quadratus Gmelin, Syst. Nat., I, 1789, 1225 (Jamaica).

Chætodipterus plumierii Lacépède, Hist. Nat. Poiss., IV, 1803, 503 (Jamaica; Carolina).

Selene quadrangularis Lacépède, Hist. Nat. Poiss., IV, 1803, 564 (Jamaica).

Ephippus gigas Cuvier, Règne Anim., Ed. II, II, 1829, 191 (America).

Ephippus faber Günther, Cat. Fish. Brit. Mus., II, 1860, 61.

Chætodipterus faber Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1882 (1883), 613; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1668, Pl. CCXLVII, fig. 619; Fowler, Proc. Ac. Nat. Sci. Phila., 1917, 135 (Colon).

Head 2.7 to 3.5; depth 1.15 to 1.4; D. VIII-I, 21 to 23; A. III, 17 to 19; scales 53 to 60.

Body short and very deep, much compressed; anterior profile steep, gently and evenly convex in young, somewhat swollen between the eyes, making the margin of snout concave in adult; head short and very deep; snout short, somewhat projecting, its length 2.2 to 2.6 in head; eye 3 to 4.2; mouth small, terminal, only very slightly protractile, a transverse fold above upper lip; maxillary reaching nearly or quite to anterior margin of eye, 3.1 to 3.35 in head; teeth very small, flexible, in narrow bands; lateral line continuous, arched; scales moderate, ctenoid, in regular series on sides; the fins all densely scaled in adult, only the soft dorsal and anal with many scales in young; dorsal fins scarcely separate, the spines of unequal length, the third the longest, notably longer than head in some of our specimens, in others notably shorter, often with a membrane posteriorly which exceeds the length of the spine; the soft dorsal anteriorly much elevated in the adult, the longest rays often reaching beyond the tips of the caudal; caudal fin nearly straight in young, gently concave in adult; anal fin with three spines, the second the largest, the soft portion similar to that of the dorsal; ventral fins moderate, longer than the pectorals, the outer ray filamentous in the young; pectoral fins short, 1.35 to 1.75 in head.

Color grayish, with brassy reflections; chest and abdomen white; sides with 6 bars; the first from above orbits through eye to throat; the second just behind margin of opercle; the third a narrow half-bar extending from base of fourth and fifth dorsal spines to or slightly below middle of side; the fourth bar broad, extending from origin of second dorsal to origin of anal; the fifth bar under middle of soft dorsal; the sixth at base of caudal; fins grayish green; the ventrals and the membranes of spinous dorsal often very dark. Very young (35 mm.) dead leaf color, with paler spots and lines; the dark bars of the adult only faintly visible.

This species is common on the Atlantic coast of Panama and is extensively used as food. We preserved 16 specimens, ranging from 35 to 385 mm. in length.

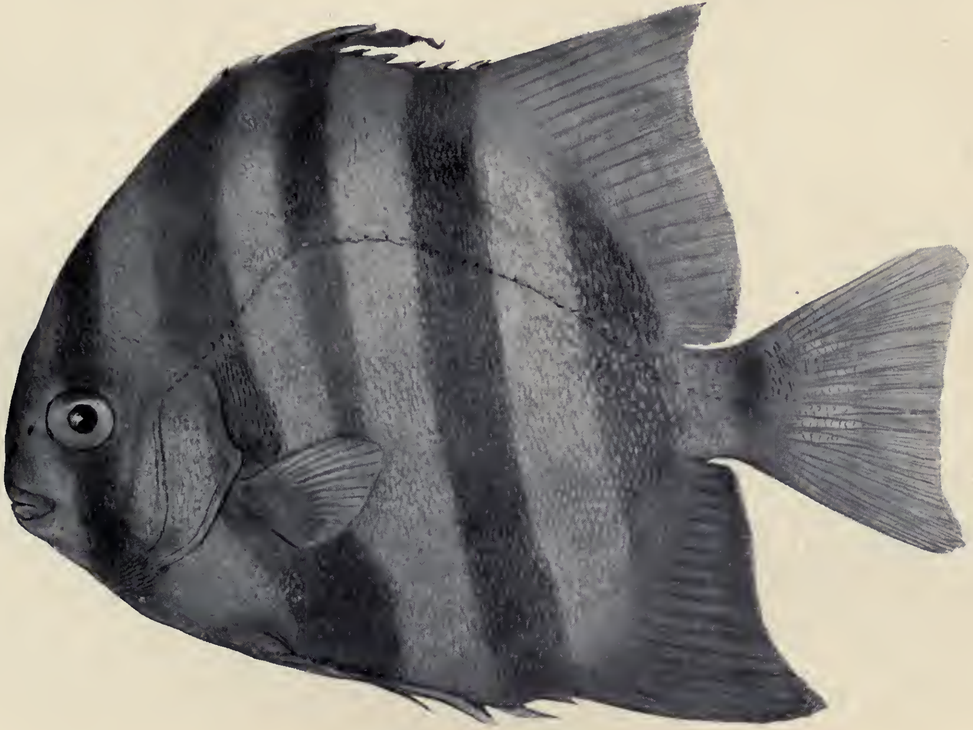
Known from Massachusetts south to Rio de Janeiro, Brazil. Our specimens are from Toro Point, Mindi, Christobal, and Colon.

550. Chætodipterus zonatus (Girard). (Plate LXXVI.)

Ephippus zonatus Girard, (House of Repr. Ex. Doc. No. 91) Rept. Expl. & Surv. Miss. R. to Pac. O., X, Pt. IV, 1858, 110 (San Diego, California).

Chætodipterus zonatus Jordan, Proc. U. S. Nat. Mus., 1885, 385; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1668; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 147 (Panama Bay); Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 411 (Panama Bay).

Head 2.8 to 3.55; depth 1.25 to 1.57; D. VIII-I, 21 to 23; A. III, 18 to 20; scales about 75 to 90.



CHÆTODIPTERUS ZONATUS (Girard).
From a specimen 155 mm. in length.

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Body moderately deep, strongly compressed; anterior profile steep, gently and evenly convex in young, swollen between the eyes in very large examples, making the anterior margin of snout nearly vertical, but not concave; head short and deep; snout little projecting, its length 2.5 to 3 in head; eye 3.1 to 3.75; mouth small, terminal, only very slightly protractile, a transverse fold above upper lip; maxillary reaching opposite anterior margin of eye, 3.1 to 3.45 in head; teeth very small, flexible, in narrow bands; lateral line continuous, arched; scales very small, in irregular series, difficult to enumerate; fins all densely scaled in adult, only the vertical fins with many scales in the young; dorsal fins scarcely separate, the spines of unequal length, the third the longest, varying greatly among individuals, sometimes not much longer than eye, occasionally as long as head without opercle; the soft dorsal anteriorly notably elevated, the longest rays reaching somewhat past base of caudal in large examples; caudal fin gently concave in adult, round in very young; anal fin with 3 short spines, the soft portion similar to that of dorsal, ventral fins notably longer than the pectorals, the outer ray filamentous in young; pectoral fins short, 1.3 to 1.7 in head.

Color silvery gray, with black bars arranged as in *C. faber*. Very young (30 mm.) brownish, with slightly darker marking; the dark bands of the adult only faintly visible.

This species is common on the Pacific coast of Panama. It is used quite extensively as food. We preserved 16 specimens, ranging in length from 30 to 275 mm.

It differs from *C. faber,* its Atlantic congener, very strikingly in the much smaller and more irregularly arranged scales. The shorter dorsal spines of the present species, an alleged difference, while generally true is not always a reliable character, due to much variation among individuals. When specimens of like size are compared, it will be seen that the Pacific coast representative has a more elongate body, less strongly projecting snout, and the produced portions of the dorsal and anal are shorter.

Known from San Diego, California, southward to Guayaquil, Ecuador. Our specimens were taken at Taboga Island, Balboa, and in the Panama City market.

198. Genus **Parapsettus** Steindachner.

Parapsettus Steindachner, (Sitzb. k. Ak. Wiss. Wien, LXXII) Ichth. Beitr., III, 1875, 50 (type *Parapsettus panamensis* Steindachner).

This genus differs from *Chætodipterus* principally in the much shorter dorsal spines which are shorter than pupil and all of about equal length. There is no transverse fold above the upper lip, the mouth is not protractile, and the ventral fins are much smaller. A single species of this genus is known.

551. Parapsettus panamensis Steindachner.

Parapsettus panamensis Steindachner, (Sitzb. k. Ak. Wiss. Wien, LXXII) Ichth. Beitr., III, 1875, 51, Pl. VII (Panama); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1669; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 148 (Panama Bay); Starks, Proc. U. S. Nat. Mus., 1906, 798 (Guayaquil, Ecuador).

Head 3.35 to 3.55; depth 1.25 to 1.35; D. IX (rarely VIII), 25 or 26; A. III, 22 to 24; scales 100 to 110.

Body short and deep, strongly compressed; anterior profile vertical on margin of snout, swollen between the eyes, straight or slightly concave above the eyes; head short and deep; snout very blunt, its length 4.35 to 4.95 in head; eye 3.5 to 4.6; mouth small; the lower jaw included; premaxillaries not protractile, without a transverse fold above upper lip; maxillary reaching opposite middle of eye, 3.15 to 3.35 in head; teeth in the jaws very small, flexible, in narrow bands; lateral line continuous, arched; scales very small, the series irregular and difficult to enumerate; vertical fins densely scaled at least at base; dorsal fin long, continuous, the spines very short and of about equal length, preceded by a small, antrorse, scarcely hidden spine, the soft portion anteriorly somewhat elevated but not filamentous; caudal fin slightly double concave, angulate at outer rays; anal fin with 3 very short spines, the soft portion similar to that of the dorsal; ventral fins very small, notably shorter than pectorals, the outer ray filamentous; pectoral fins moderate, 1 to 1.15 in head.

Color in alcohol silvery gray; ventral fins dusky.

This species, although reported *not rare* in the Panama market by Gilbert & Starks, was not seen by us. The above description is based on 5 specimens from the National Museum collection, ranging from 150 to 190 mm. in length, taken at Panama and Guayaquil, Ecuador.

Known from Panama south to Guayaquil, Ecuador.

Family LXIV. **Chætodontidæ.**

THE BUTTERFLY-FISHES.

Body short and deep, usually strongly compressed; head short; mouth small, terminal, protractile; teeth numerous, slender, bristle-like, in narrow bands, none on palatines or vomer; gill-membranes attached to the isthmus; gill-rakers short; pseudobranchiæ large; branchiostegals 6 or 7; scales rather small, ctenoid; lateral line concurrent with the back, not extending on caudal fin; dorsal fin single, continuous, the soft part usually elevated anteriorly, often filamentous, densely scaled; anal fin with 3 or 4 spines, the soft portion usually similar to that of the dorsal; ventral fins thoracic, with I, 5 rays. This family consists of brilliantly colored fishes of the tropical seas, the young often being very different from the adult. Three genera are represented in the Panama fauna.*

KEY TO THE GENERA.

a. Preopercle without an enlarged spine; dorsal spines not graduated, some of the anterior ones longer than the last ones. *Chætodon,* p. 765.

aa. Preopercle with an enlarged spine at its angle; dorsal spines graduated.

b. Body very deep, much compressed; interopercle unarmed; scales small, unequal, not in regular series; dorsal fin with 8 to 11 spines. *Pomacanthus,* p. 772.

bb. Body oblong, rather robust; interopercle armed with from 1 to 4 spines; scales rather large, in regular series; dorsal fin with 12 to 15 spines. *Holacanthus,* p. 777.

199. Genus **Chætodon** Linnæus.

Chætodon Linnæus, Syst. Nat., Ed. X, 1758, 272 (type *Chætodon capistratus* Linnæus).

Chætodon Cuvier, Règne Animal, Ed. I, II, 1817, 333 (types *Chætodon striatus* & *capistratus,* first restricted to this group).

Rabdophorus Swainson, Nat. Hist. & Class. Fish., II, 1839, 211 (type *Chætodon ephippium* Bloch).

Citharœdus Kaup, Archiv. Naturg., XXVI, 1860, 136 (type *Chætodon ornatissimus* Solander).

Linophora Kaup, Archiv. Naturg., XXVI, 1860, 137 (type *Chætodon auriga* Forskål).

Sarothrodus Gill, Proc. Ac. Nat. Sci. Phila., 1861, 99 (type *Chætodon capistratus* Linnæus; offered as a substitute for *Chætodon,* the latter name being transferred to *Pomacanthus*).

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*A fourth genus (one species, *Angelichthys ciliaris*) was recorded, since these pages were prepared, from Colon, by Fowler (Proc. Ac. Nat. Sci. Phila., 1917, p. 135).

Tholichthys Günther, Ann. & Mag. Nat. Hist., Ser. 4, I, 1868, 457 (type *Tholichthys osseus* Günther).

Tetragonopterus Bleeker, Versl. Ak. Amsterdam, 2 ser., II, 1868, 300 (type *Chætodon capistratus* Linnæus).

Body short, deep, much compressed; head short; snout pointed; mouth small, terminal; teeth in jaws slender, flexible, numerous, in bands; preopercle without an enlarged spine; lateral line much arched; scales firm, ctenoid, present almost everywhere except on head; dorsal fin long, continuous, with about 12 or 13 spines, not graduated; caudal fin straight or rounded; anal fin similar to soft portion of dorsal, preceded by 3 strong spines; ventral spine strong. This is a large genus of beautiful fishes, most of them being rather small. Five species are represented in the Panama collection.

KEY TO THE SPECIES.

a. Scales above axis of body running obliquely upward and backward, those below the axis running similarly downward and backward; rows of scales marked by distinct dark streaks.

b. Dorsal with 13 spines; a single band present, passing through eye; a large jet-black ocellus present on side below soft dorsal. (Very young with a dusky bar on sides from anterior dorsal spines to abdomen and a small ocellus on soft dorsal.) *capistratus,* p. 767.

bb. Dorsal with 12 spines; sides with 3 or 4 broad black bands; no ocellus on sides below dorsal; young with a black ocellus on anterior rays of soft dorsal. *striatus,* p. 768.

aa. Scales on upper part of sides running obliquely upward and backward, those on the lower parts becoming nearly horizontal; rows of scales without definite dark streaks.

c. Dorsal with XII, 24 or 25 rays; scales 45 to 56; lateral line present on caudal peduncle; a wedge-shaped bar from origin of dorsal to eyes, but not extending through the eyes. *nigrirostris,* p. 769.

cc. Dorsal with XII or XIII, 18 to 21 rays; lateral line extending under base of soft dorsal, not present on caudal peduncle; occular band present.

d. Dorsal with 13 spines; sides of head and body with 3 or 4 black bands; caudal fin with black bars in adult. *humeralis,* p. 770.

dd. Dorsal with 12 spines; only the occular band present in the adult; a more or less distinct dusky band on base of caudal in the young. *ocellatus*, p. 771.

552. Chætodon capistratus Linnæus.

Chætodon capistratus Linnæus, Syst. Nat., Ed. X, 1758, 275 ("India"; based on specimen in Mus. Adolph Frederici); Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1882 (1883), 940; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1677, Pl. CCL, fig. 622; Fowler, Proc. Ac. Nat. Sci. Phila., 1917, 135 (Colon).

Sarothrodus capistratus Poey, Enumeratio, 1875, 62.

Chætodon bricei Smith, Bull. U. S. Fish Comm., XVII, 1897 (1898), 102, with figure (Woods Hole, Mass.).

Head 2.5 to 3.4; depth 1.35 to 1.7; D. XIII, 19 or 20; A. III, 16 to 18; scales 36 to 44.

Body deep, strongly compressed; anterior profile slightly concave in adult, nearly straight in young; head short, deep; snout moderately pointed, 2.6 to 3.3 in head; eye 2.55 to 2.9; mouth small, terminal; teeth in the jaws slender, flexible, very numerous, in bands; gill-membranes attached to the isthmus, the rakers very short; lateral line arched, ending at base of last rays of dorsal; scales moderate, reduced on head, chest and caudal peduncle, the rows on sides above axis of body running obliquely upward and backward, those below axis extending downward and backward; vertical fins densely scaled; dorsal fin long, its origin over margin of preopercle, the spines rather strong, the longest slightly longer than eye and snout; caudal fin with gently convex margin posteriorly; anal fin with strong spines, the soft portion similar to that of the dorsal; ventral fins reaching slightly past origin of anal in young, to vent in adult; pectoral fins inserted over or a little in advance of ventrals, 1.1 to 1.5 in head.

Color brownish, with more or less yellow on lower parts; rows of scales on sides marked with very distinct black streaks; a jet-black band, edged with white on sides, extending from nape through eye to throat; young with a broad dusky band from anterior dorsal spine to abdomen, passing behind base of pectorals, wanting in adult; very young with two black ocelli, a small one not much larger than pupil on the anterior rays of dorsal and one larger than eye on side below base of posterior rays of dorsal, the one on the dorsal disappearing with age, sometimes remaining faintly visible in specimens 30 mm. in length, but disappearing wholly in larger ones; the large ocellus on body below dorsal persisting; dorsal, caudal and anal each with a brown band, becoming dark on each edge, bounded on outer side on dorsal and anal by a narrow white line, on the caudal by broad pale band on each side; the margin of the vertical fins plain translucent.

This is a common species on the Atlantic coast of Panama. We preserved 82 specimens, ranging in length from 25 to 105 mm. It was found on rocky bottom as well as on soft bottom which supported vegetation.

Known from Massachusetts south to Trinidad. Our specimens are from Colon and Porto Bello.

553. Chætodon striatus Linnæus.

Chætodon striatus Linnæus, Syst. Nat., Ed. X, 1758, 275 (India); Eigenmann & Horning, Ann. N. Y. Ac. Sci., IV, 1887, 8; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1677.

Sarothrodus striatus Poey, Syn. Pisc. Cub., 1868, 352.

Head 2.4 to 2.85; depth 1.4 to 1.6; D. XII, 19 to 21; A. III, 16 to 18; scales 39 to 44.

Body very deep, strongly compressed; anterior profile concave, except in very young; head short; snout pointed, 2.7 to 3.1 in head; eye 2.5 to 3.1; mouth very small, terminal; teeth in the jaws slender, flexible, in bands; gill-membranes attached to isthmus, the rakers rudimentary; lateral line strongly arched, ending at base of last rays of dorsal; scales moderate, ctenoid, those on the head reduced, rows on sides above axis running obliquely upward and backward, those below the axis running downward and backward; vertical fins densely scaled, except in very young; dorsal fin long, its origin over or slightly in advance of posterior margin of opercle, the spines moderate, the longest equal to the distance from end of snout to preopercular margin; caudal fin with straight or slightly rounded margin; anal fin with rather strong spines, the soft portion similar to that of the dorsal but slightly shorter; ventral fins reaching to or slightly beyond origin of anal in young, to vent in adult; pectoral fins inserted over base of ventrals, 1.1 to 1.5 in head.

Color pale greenish; the rows of scales on sides marked by dark streaks; a black band from nape through eye to throat; a broader band from anterior spines of dorsal to abdomen, passing just behind base of pectorals and ventrals; another broad band extending from tips of last spines of dorsal to tips of anterior rays of anal; a fourth band usually present on posterior part of soft dorsal and anal, crossing caudal peduncle; this bar indefinite in some specimens and represented by a small ocellus on the caudal peduncle in one (32 mm.); anterior rays of soft dorsal with a distinct ocellus in young, only slightly smaller than eye, becoming a mere blotch and disappearing when the fish reaches a length of about 55 mm.; dorsal and anal each with pale margin posteriorly; caudal fin with alternating black and pale bars; ventral fins mostly black; pectorals plain translucent.

This species is not abundant on the coast of Panama. We have ten specimens, ranging in length from 25 to 55 mm. The smallest one was taken from a tide pool and the others were seined from among eel-grass.

Known from the West Indies to Brazil. Our specimens are from Toro Point, Colon and Porto Bello.

554. Chætodon nigrirostris (Gill).

Sarothrodus nigrirostris Gill, Proc. Ac. Nat. Sci. Phila., 1862, 243 (Cape San Lucas).

Chætodon nigrirostris Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 365; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1673, Pl. CCXLVIII, fig. 620; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 148, Pl. XXIV, fig. 47 (Panama Bay); Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 142 (Acapulco; Perico Island, Panama Bay).

Chætodon capistratus Boulenger, Boll. Mus. Zoöl. Anat. Torino, XIV, No. 346, 1899, 3 (Darien, Panama; not of Linnæus).

Head 2.55 to 3; depth 1.2 to 3.45; D. XII, 24 or 25; A. III, 18 or 19; scales 45 to 56.

Body very deep, strongly compressed; anterior profile deeply concave; head short; snout pointed, 2.65 to 2.85 in head; eye 2.9 to 3.45; mouth very small, terminal; maxillary slipping under preorbital, about three-fourths the length of eye; teeth in the jaws pointed, flexible, in bands; gill-membranes attached to the isthmus, the rakers obsolete; lateral line much arched, becoming straight on caudal peduncle; scales ctenoid, reduced on head (except cheek) and caudal peduncle, the rows running obliquely upward and backward above median line of side, nearly horizontal on lower parts; vertical fins densely scaled, except on margins; dorsal fin long, its origin only slightly behind vertical from posterior margin of eye, the spines very strong, the longest one a little longer than eye and snout; margin of caudal fin straight or slightly convex; anal fin with strong spines, the soft portion similar to that of dorsal, but shorter and with a somewhat more strongly convex margin; ventral fins moderate, equal to or somewhat longer than pectorals, reaching past origin of anal in young, to vent in adult; pectoral fins inserted slightly in advance of ventrals, 1 to 1.2 in head.

Color of a fresh specimen 160 mm. in length: Ground color of head pale; body and fins yellowish green; upper part of snout mostly jet-black; a dark blotch above each eye; a wedge-shaped bar beginning at origin of dorsal, extending toward orbits, bordered posteriorly by a pale yellow bar; margin of opercle jet-black; a narrow black bar above and behind upper angle of gill-opening; upper part of base of pectoral black; a broad jet-black bar extending from fourth dorsal spine across base of dorsal and caudal peduncle. In the young the black margin of opercle, the bar above and behind upper angle of gill-opening and the black base of pectorals are all united in one broad bar.

This apparently rare species is represented in the Panama collection by only two specimens, respectively 150 and 160 mm. in length. These were secured by the use of dynamite off the shores of a small island near Balboa. We have the "type specimens" for comparison.

Known from Cape San Lucas to the Galapagos Islands. Our specimens are from Balboa.

555. Chætodon humeralis Günther.

Chætodon humeralis Günther, Cat. Fish. Brit. Mus., II, 1860, 19 (? "Sandwich Islands"; probably Panama); Günther, Proc. Zoöl. Soc. London, 1866, 419, Pl. LXV, fig. 3; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1674; Boulenger, Boll. Mus. Zoöl. Anat. Torino, XIV, No. 346, 1899, 3 (Darien, Panama); Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 149 (Panama Bay); Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 142 (Acapulco; Perico and Taboguilla islands, Panama Bay); Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 411 (Panama Bay).

Head 2.3 to 3.1; depth 1.3 to 1.55; D. XIII, 18 to 20; A. III, 15 to 17; scales 35 to 40.

Body deep, strongly compressed; anterior profile concave in adult, straight or even slightly convex in very young; head short and deep; snout moderately pointed, 2.8 to 3.7 in head; eye 2.6 to 3.35; mouth very small, terminal; maxillary mostly exposed, about ¾ the length of eye; teeth in the jaws very numerous, flexible, bristle-like, in bands; gill-membranes attached to the isthmus, the rakers obsolete; lateral line strongly arched, ending at base of last rays of dorsal, not present on caudal peduncle; scales large on anterior part of sides, notably reduced on head, the rows running obliquely upward and backward on upper part of sides, becoming nearly horizontal on lower parts; vertical fins densely scaled; dorsal fin long, its origin over margin of opercle, the spines strong, the longest equal to distance from end of snout to margin of preopercle; caudal fin straight or slightly rounded;

anal fins with rather strong spines, the soft portion similar to that of dorsal; ventral fins moderate, reaching beyond origin of anal in young, sometimes failing to reach vent in adult; pectoral fins inserted slightly in advance of base of ventrals, 1.1 to 1.5 in head.

Color of adult in life yellowish; tip of upper jaw black; a dark band from nape through eye to lower margin of opercle; a broader band, about equal to length of eye, from base of first dorsal spines to and across base of pectoral; another broad black band from tips of last dorsal spines to base of anterior rays of anal; a narrow black band at base of caudal and two on caudal fin; soft dorsal and anal with a broad intramarginal band and with a narrow yellowish margin; very young similar to adult, but the rows of scales on sides marked with more or less distinct dark stripes; and the caudal fin without black bars.

This is a common species on the Pacific coast of Panama. We preserved 72 specimens, ranging in length from 33 to 130 mm. It is occasionally seen in the markets and is used as food to a limited extent. It is common in rocky tide pools and on the shores of the small islands near Panama City.

Known from Guaymas to Panama. Our specimens are from Taboga Island, Naos Island, tide pools at Balboa and Panama.

556. **Chætodon ocellatus** Bloch.

Chætodon ocellatus Bloch, Naturg. Ausl. Fische, III, 1787, 105, Pl. CCXI, fig. 2 (?East Indies); Eigenmann & Horning, Ann. N. Y. Ac. Sci., IV, 1887, 7; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1674, Pl. CCXLIX, fig. 621; Fowler, Proc. Ac. Nat. Sci. Phila., 1917, 135 (Colon).

Chætodon bimaculatus Bloch, Naturg. Ausl. Fische, IV, 1790, 9, Pl. CCIX, fig. 1 (? East Indies).

Sarothrodus maculo-cinctus Gill, Proc. Ac. Nat. Sci. Phila., 1861, 99 (Newport, R. I.; young).

Sarothrodus amplexicollis Poey, Enumeratio, 1875, 63 (Cuba; young).

Chætodon maculocinctus Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1882 (1883), 615.

Head 2.5 to 3; depth 1.35 to 1.6; D. XII, 19 to 21; A. III, 16 to 18; scales 27 to 35.

Body very deep, strongly compressed; anterior profile notably concave, except in very young; head short and deep; snout pointed, 2.5 to 2.85 in head; eye 2.5 to 3.5; mouth very small, the lower jaw slightly in advance of the upper; maxillary slipping under preorbital, its length somewhat less than the diameter of the eye; teeth in the jaws slender, flexible, in bands; gill-membranes attached to isthmus, the rakers rudimentary; lateral line running high, and ending under the posterior rays of the soft dorsal; scales ctenoid, large on sides, reduced on caudal peduncle and on head, the rows running obliquely upward and backward on upper portion of sides and becoming nearly horizontal below; vertical fins densely scaled; dorsal fin long, its origin over upper angle of gill-opening, the spines strong, the longest one about equal to length of eye and snout; caudal fin with straight or slightly rounded margin; anal fin with strong spines, the soft portion similar to soft dorsal; ventrals moderate, nearly as long as pectorals, reaching past origin of anal in young, not quite to vent in adult; pectoral fins inserted slightly in advance of base of ventrals, 1.3 to 1.45 in head.

Color in life of a specimen 140 mm. in length: Body gray on sides, base of each scale pale; lower parts yellowish; a yellow streak from angle of mouth backward to eye; a jet-black bar, about three-fourths the width of eye, extending from origin of dorsal through eye to lower margin of opercle, this bar with a yellow margin posteriorly above eye; membranous margin of opercle, base of pectorals, and caudal peduncle orange; fins all orange; dorsal with pale margin and a jet-black quadrate spot at the tips of the longest rays; caudal fin with a pale margin and pale band across distal third; anal fin with pale streaks. In the young a black bar extends from the base of the soft dorsal to the base of the anal, the bar being broadest and most distinct on base of dorsal, where a dark blotch is evident even in moderately large examples (120 mm.); the soft dorsal of the young with an intramarginal black line broadened on the longest rays, later giving rise to a quadrate blotch; this dark marking on the distal part of the dorsal wholly wanting in our smallest individuals (32 mm.).

This fish is apparently rather rare on the coast of Panama. We secured only 8 specimens, ranging in length from 32 to 140 mm.

The range of this species reaches from Massachusetts to Trinidad. Our specimens were taken at Toro Point; Fox Bay, Colon; and Porto Bello.

200. Genus **Pomacanthus** Lacépède.

Pomacanthus Lacépède, Hist. Nat. Poiss., IV, 1803, 517 (type *Chætodon arcuatus* Linnæus).

Pomacanthodes Gill, Proc. Ac. Nat. Sci. Phila., 1862, 244 (type *Pomacanthodes zonipectus* Gill).

Body very deep, much compressed; head short, blunt; preopercle slightly serrate or entire, a very strong spine at its lower posterior angle; interopercle unarmed; scales small, unequal; dorsal and anal densely scaled; dorsal with 8 to 11 graduated spines, the soft portion usually much elevated in front in the adult; caudal fin with straight or rounded margin; anal fin with 3 strong graduated spines, the soft portion usually similar to that of dorsal. The individuals vary much with age and the species are often difficult to define. Only three species, two on the Pacific and one on the Atlantic, were taken.

KEY TO THE SPECIES.

a. Dorsal fin with 9 spines; caudal fin with straight or slightly concave margin, angulate at outer rays; soft dorsal and anal anteriorly much elevated in adult; each scale on side with pale margin; caudal fin with a broad pale margin. *arcuatus*, p. 773.

aa. Dorsal fin with 10 spines; caudal fin convex, not angulate at outer rays; soft dorsal and anal anteriorly much elevated in adult; only a part of the scales on sides with white margins; caudal fin with a very narrow pale margin. *paru*, p. 775.

aaa. Dorsal fin with 11 spines; caudal fin convex, not angulate at outer rays; soft dorsal anteriorly moderately elevated; anal fin with convex margin, never angulate or elevated; some of the scales on sides with black bases and pale blue margins. *zonipectus*, p. 776.

557. Pomacanthus arcuatus (Linnæus).

Chætodon arcuatus Linnæus, Syst. Nat., Ed. X, 1758, 273 ("India"; from specimen in Mus. Adolph Frederici).

Chætodon aureus Bloch, Naturg. Ausl. Fische, III, 1787, 49, Pl. CXCIII, fig. 1 (Martinique; on a drawing by Plumier).

Chetodon lutescens Bonnaterre, Tableau Encyclo., Ichth., VI, 1788, 82 (Jamaica; after Browne).

Pomacanthus aureus Lacépède, Hist. Nat. Poiss., IV, 1803, 518.

Pomacanthus balteatus Cuvier & Valenciennes, Hist. Nat. Poiss., VII, 1831, 208 (Porto Rico).

Pomacanthus cingulatus Cuvier & Valenciennes, Hist. Nat. Poiss., VII, 1831, 209, Pl. CLXXXV (West Indies; probably Porto Rico).

Pomacanthus quinquecinctus Cuvier & Valenciennes, Hist. Nat. Poiss., VII, 1831, 210 (West Indies; probably Porto Rico).

Pomacanthus paru Günther, Cat. Fish. Brit. Mus., II, 1860, 55 (in part).

Chætodon littoricola Poey, Syn. Pisc. Cub., 1868, 351 (Cuba).

Pomacanthus arcuatus Jordan & Rutter, Proc. Ac. Nat. Sci. Phila., 1897, 125; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1679, Pl. CCLI, fig. 623; Starks, Leland Stanford Jr. Univ. Pub., Univ. Ser., 1913, 62; Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 405 (Colon); Breder, Zoologica, IV, Pt. 4, 1925, 156 (Caledonia Bay).

Head 3.3 to 3.85; depth 1.3 to 1.4; D. IX, 32 or 33; A. III, 23 to 25; scales about 80.

Body deep, strongly compressed; anterior profile rather steep, straight or gently convex; head very short, deep; snout blunt, 2.1 to 2.9 in head; eye 3 or 4; mouth small, oblique, the lower jaw in advance of the upper; teeth in the jaws numerous, slender, flexible, in bands; preopercular margin smooth in adult, crenate in young, the spine at lower angle large, flattened, with a sharp point and cutting edges; gill-membranes attached to the isthmus, the rakers short; lateral line arched, continuous; scales ctenoid, much reduced on head and chest, irregular on sides, lateral series difficult to enumerate; vertical fins densely scaled; dorsal fin long, its origin over or a little behind posterior margin of opercle, the spines graduated, the longest one not much shorter than head, a few of the anterior rays of the soft dorsal much produced in adult, filamentous; caudal fin straight or slightly concave, angulate at outer rays (this condition not evident in young of less than 90 mm.); anal fin preceded by 3 strong graduated spines, the soft portion similar to that of the dorsal; ventral fins long, the outer rays filamentous; pectoral fins rather short, 1.1 to 1.25 in head.

Color of adult in alcohol brownish, each scale on sides with a pale margin; fins dark brown, the caudal with a broad pale margin; young much darker; very young nearly black; a white bar on snout at angle of mouth; another white bar from nape across preopercular margin to chest; a third bar curved forward from tips of last dorsal spines across body to origin of anal; a fourth bar from middle of soft dorsal, curved forward and ending on tips of middle anal rays; a white circle around caudal fin in very young; this circle forming 2 bars when the fish reaches a length of about 90 mm., one at base of caudal and one on the margin of the fin, the latter being the only bar persisting in the adult.

This species was not seen by us at Panama. It is here described from specimens from the Bahamas, West Indies and Brazil, ranging in length from 70 to 280 mm.

Known from New Jersey to Brazil. It is recorded from Panama by both Fowler and Breder.

558. Pomacanthus paru (Bloch).

Chætodon paru Bloch, Naturg. Ausl. Fische, III, 1787, 57; Pl. CXCVII, fig. 1 (Brazil).

Pomacanthus arcuatus Cuvier & Valenciennes, Hist. Nat. Poiss., VII, 1831, 211 (not of Linnæus).

Pomacanthus paru Cuvier & Valenciennes, Hist. Nat. Poiss., VII, 1831, 205; Günther, Cat. Fish. Brit. Mus., II, 1860, 55 (in part); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1680; Starks, Leland Stanford Jr. Univ. Pub., Univ. Ser., 1913, 61 (Natal, Brazil).

Head 3.1 to 3.6; depth 1.25 to 1.45; D. X, 29 to 33; A. III, 22 to 24; scales about 90.

Body very deep, strongly compressed; anterior profile rather steep, gently convex; head short, very deep; snout blunt, 2.35 to 2.8 in head; eye 2.45 to 3.6; mouth small, oblique, the lower jaw slightly in advance of the upper; teeth numerous, slender, flexible, in bands; preopercular margin slightly crenate in young, nearly straight in adult, the spine at lower angle broad, flat, with sharp point and cutting edges; gill-membranes attached to the isthmus, the rakers very short; lateral line arched, continuous; scales ctenoid, much reduced on head and anterior part of body, irregular on sides, lateral series difficult to enumerate; vertical fins densely scaled; dorsal fin long, its origin slightly behind posterior margin of opercle, the spines graduated, the longest one only slightly shorter than head; a few anterior rays of soft dorsal produced, filamentous in adult; caudal fin rounded at all ages; anal fin preceded by 3 strong spines, the soft portion similar to that of dorsal but the anterior rays not as prominently produced; ventral fins long, the outer rays more or less filamentous; pectoral fins short, 1.1 to 1.33 in head.

Color of a fresh specimen 190 mm. long: Very dark; a part of the scales on sides with yellow margins, making it appear as if the scales were much larger than they prove to be upon closer examination; a yellow bar from eye to nostrils; a faint yellowish bar at base of pectorals; margin of opercle and preopercular spine yellow; a faint pale band from produced rays of dorsal across body to vent; fins mostly black; produced rays of dorsal yellow; dorsal, caudal and anal posteriorly with very narrow white margins; pectoral fins with a broad pale margin. A small specimen, 60 mm. in length, is jet-black, with yellow cross-bars as follows: one on snout across angle of mouth, the second from nape across preopercular margin to chest, the third from tips of anterior rays of soft dorsal running forward across body to vent, the fourth from tips of soft dorsal, forward and across body to tips of middle rays of anal; and a yellow ring encircling the caudal fin. Our largest specimen is without bars except for a short one from eye to nostrils and one across base of pectoral, and the ground color of body is dark brown.

This is a rather rare species on the coast of Panama where only four specimens were secured, ranging from 60 to 215 mm. in length. Our specimens were taken on coral reefs by the use of dynamite.

Known from the West Indies southward to Brazil. It is also recorded from Ascension Island. Our specimens were taken at Toro Point, Colon Reef and Porto Bello.

559. **Pomacanthus zonipectus** (Gill).

Pomacanthodes zonipectus Gill, Proc. Ac. Nat. Sci. Phila., 1862, 244 (San Salvador).

Pomacanthus crescentalis Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881, 358 (Mazatlan; young).

Pomacanthus zonipectus Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 376; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1681, Pl. CCLII, fig. 624; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 150 (Panama Bay); Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 143 (Perico Island, Panama Bay); Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 411 (Panama Bay).

Head 3.3 to 3.7; depth 1.25 to 1.43; D. XI, 24 or 25; A. III, 20 to 22; scales about 85.

Body very deep, strongly compressed; anterior profile uneven, with more or less of a hump at the nape; head short and deep; snout very blunt, 2.4 to 3 in head; eye 2.8 to 4; mouth small, the lower jaw slightly in advance of the upper; teeth numerous, slender, flexible, in bands; preopercular margin slightly crenate, the spine on lower posterior angle large, with sharp point and cutting edges; gill-membranes attached to the isthmus, the rakers very short; lateral line arched, complete; scales ctenoid, much reduced on anterior part of body and head, the rows irregular on sides; vertical fins densely scaled; the dorsal fin long, its origin over posterior margin of opercle, the spines graduated, the longest about equal to the distance from end of snout to margin of preopercle, the anterior portion of soft dorsal produced in adult, but not as much so as in related species; caudal fin posteriorly straight or slightly rounded; anal fin preceded by 3 strong spines, the soft portion similar to that of dorsal, except that the anterior rays are never produced, the outline convex not angulate; ventral fins very long, the outer rays produced; pectoral fins short, 1 to 1.22 in head.

Color of a specimen 250 mm. in length: Dark brown; scales on sides irregularly with black bases and pale blue margins; a curved pale band bounded fore and aft with black extending from middle of spinous dorsal to vent; fins very dark, the pectorals with pale spots. Color of the young (45 mm.) as in *P. paru,* except that the yellow bars are apparently slightly narrower and more numerous, there being 6 instead of 4; the anterior 4 situated as in *P. paru,* but the fifth bending forward from the end of the posterior rays of soft dorsal across body to end of posterior rays of anal; the sixth bar on the middle of the caudal fin.

This species, although reported rare by Gilbert & Starks, was found to be fairly common. We preserved 23 specimens ranging from 100 to 255 mm. in length. Besides these we have examined small specimens from Nicaragua and Perico Island, Panama Bay. It is used as food to a limited extent.

Known from Mazatlan to Panama. Our specimens are from Taboga Island, Balboa and the Panama City market.

201. Genus **Holacanthus** Lacépède.

Holacanthus Lacépède, Hist. Nat. Poiss., IV, 1803, 525 (type *Chætodon tricolor* Linnæus).

Genicanthus Swainson, Nat. Hist. & Class. Fish., II, 1839, 212 (type *Holacanthus lamarckii* Cuvier).

Centropyge Kaup, Archiv. Naturg., XXVI, 1860, 140 (type *Centropyge tibicen* Kaup).

Acanthochætodon Bleeker, Arch. Néerl. Sci. Nat., XI, 1876, 308 (type *Holacanthus annularis* Lacépède).

Body oblong, rather robust; back not compressed; head short and blunt; preopercle serrate, with a large spine at its lower posterior angle, this spine often preceded by 1 or 2 short spines on lower margin of preopercle; interopercle with from 1 to 4 short spines; preorbital anteriorly with 2 or more large serræ; scales firm, strongly ctenoid, small accessory scales often present; dorsal with 12 to 15 spines, usually graduated; soft dorsal and anal anteriorly elevated or not; color unusually brilliant. The species are common in all tropical seas. A single species is known from Panama (west coast). We, however, have included in our discussion the single known species from the

Atlantic coast of America which has been recorded from localities both north and south of the Isthmus.

KEY TO THE SPECIES.

a. Scales on sides each with several accessory scales on base; caudal fin with convex margin, the outer rays never produced nor angulate; head and trunk black; sides with a white bar (young also with several narrow bluish bars). *passer*, p. 778.

aa. Scales on sides each with a single accessory scale on base or none; outer rays of caudal produced in adult, merely angulate in young; head and anterior part of trunk yellow, the rest of body black. *tricolor*, p. 779.

560. Holacanthus passer Valenciennes.

Holacanthus passer Valenciennes, Voy. Vénus, Zoöl., Poiss., 1846, Pl. VI, text, 1855, 327 (Galapagos Islands).

Holacanthus strigatus Gill, Proc. Ac. Nat. Sci. Phila., 1862, 243 (Cape San Lucas).

Pomacanthus passer Eigenmann & Horning, Ann. N. Y. Ac. Sci., IV, 1887, 14.

Holacanthus passer Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1682; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 150 (Panama Bay); Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 143 (Acapulco; Taboguilla Island, Panama Bay; Chatham Island).

Head 3.25 to 4; depth 1.45 to 1.65; D. XIV, 18 to 20; A. III, 17 to 19; scales 46 to 53.

Body rather deep, moderately compressed; anterior profile concave in adult, a slight nuchal hump present; head short, deep; snout blunt, 2.4 to 2.5 in head; eye 4 to 4.95; mouth small, terminal; teeth numerous, slender, flexible, in bands; posterior margin of preopercle serrate, the spine at lower angle extremely large, preceded by 2 or 3 short spines on lower margin of the preopercle, these becoming obsolete in very large examples; interopercle with from 1 to 3 short spines; gill-membranes narrowly attached to the isthmus, the rakers very short; lateral line arched, becoming horizontal only on caudal peduncle; scales very strongly ctenoid, reduced on head, in regular series on sides, the large scales with several small accessory scales at base; vertical fins densely scaled; dorsal fin long, the spines strong, graduated, the longest slightly exceeding the length of snout, the soft dorsal anteriorly much elevated in adult; caudal fin slightly convex at all ages, the outer rays never produced nor angulate; anal fin with 3 strong spines, the soft portion similar to that of dorsal; ventral fins long, the outer rays more or less produced; pectoral fins rather short, 1.1 to 1.4 in head.

Color of adult satin-black; a white bar with its origin under fifth and sixth dorsal spines extending down sides and ending under tips of pectorals; scales on sides behind the white bar with greenish margins; angle of mouth yellow; a greenish yellow region about the base of pectorals; a purple bar from eye to eye; lining of gill-covers yellow; dorsal and anal mostly satin-black; the spinous dorsal deep orange; the soft dorsal with a narrow orange intramarginal band and a blue margin; anal with streaks of red, becoming broadest on distal part of the rays, the margin blue; caudal fin orange, with a narrow yellow band at base and a very narrow dark blue margin; ventrals pale yellow; pectorals uniform orange. Young with 2 distinct blue bands on head, one just anterior to eyes, the other just back of eyes; 4 indistinct bluish bars between the white bars on side and base of caudal.

This species, although reported as common in the rocky pools about Panama City by Gilbert & Starks, was rarely seen by us. We secured only 7 specimens, ranging from 140 to 305 mm. in length. We have for comparison the type of *H. strigatus* Gill, a specimen 85 mm. in length, upon which we base the color description of the young. A comparison of specimens of this species and *H. tricolor* shows that the present species possesses more numerous accessory scales at the base of the large scales, the caudal fin is always rounded, never angulate, and the color is very strikingly different.

Known from Acapulco south to the Galapagos Islands. Our specimens are from Taboga Island and Balboa.

561. Holacanthus tricolor (Bloch).

Chætodon tricolor Bloch, Naturg. Ausl. Fische, IX, 1795, 103, Pl. CCCCXXVI.

Holacanthus tricolor Lacépède, Hist. Nat. Poiss., IV, 1803, 525; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1684, Pl. CCLIII, fig. 625; Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 405 (Colon).

Genicanthus tricolor Swainson, Nat. Hist. & Class. Fish., II, 1839, 212.

Pomacanthus tricolor Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1882 (1883), 941.

Head 3.5 to 3.9; depth 1.45 to 1.95; D. XIV (rarely XV), 17 or 18; A. III, 17 to 19; scales 44 to 48.

Body moderately elongate, compressed; anterior profile gently convex; head short; snout blunt, 2.2 to 2.75 in head; eye 3.1 to 4.4; mouth small, terminal; teeth in the jaws numerous, slender, flexible, in bands; posterior margin of preopercle serrate, with an excessively large spine at lower angle, preceded by a small spine on lower margin of preopercle; interopercle with 2 or 3 short spines; gill-membranes narrowly attached to the isthmus, the rakers short; lateral line arched, becoming straight on caudal peduncle; scales strongly ctenoid, reduced on head, in regular series on sides, the large scales with a single accessory scale at base or none; vertical fins densely scaled; dorsal fin long, the spines strong, graduated, the longest equal to length of eye and snout, the soft portion anteriorly produced in adult, filamentous; caudal fin convex, with the outer rays produced in adult, simply convex in young; anal fin with 3 strong spines, the soft portion similar to that of the dorsal; ventral fins moderate the outer rays more or less produced; pectoral fins rather short, 1.1 to 1.4 in head.

Color in spirits: Head, anterior part of trunk, caudal, ventrals and pectorals pale (golden yellow in life); the rest of the body and lips black; dorsal and anal posteriorly with pale margin (scarlet in life).

This species was not taken by us, but it has been recorded from Panama by Fowler. It is here described from specimens from the West Indies, ranging from 100 to 190 mm. in length.

Known from Bermuda south to Bahia, Brazil.

Family LXV. **Acanthuridæ.***

SURGEON-FISHES.

Body ovoid or oblong, compressed; head short; snout long; eye placed high; preorbital broad; nostrils double; mouth small, terminal; teeth in a single series in each jaw; gill-opening restricted, the membranes attached to the isthmus; gills 4, a slit behind the fourth; gill-rakers rudimentary; pseudobranchiæ large; scales small; sides of caudal peduncle armed with one or more spines or bony plates; lateral line complete; pelvic bones long and narrow; air bladder large; intestinal canal long; pyloric cæca few; dorsal fin single, very long, the spinous part shorter than the soft part; anal fin similar to soft portion of dorsal; ventral fins present, thoracic, with 5 soft rays and one spine. Fishes of tropical or subtropical waters. Two genera are represented on the coasts of Panama.

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*This family is given under the name *Hepatidæ* in the "Key to the Families" in Part I, p. 22, of the present work.

KEY TO THE GENERA.

a. Caudal peduncle armed with a single sharp-edged spine, capable of being erected from a groove. *Acanthurus*, p. 781.

aa. Caudal peduncle armed with immovable spines, tubercles or plates. *Xesurus*, p. 785.

202. Genus **Acanthurus** Forskål.

Acanthurus Forskål, Descr. Animal., 1775, 59 (type *Chætodon sohal* Forskål).

Aspisurus Lacépède, Hist. Nat. Poiss., IV, 1803, 556 (type *Chætodon sohar* Forskål).

The caudal peduncle of this genus is armed with a single sharp movable spine, which is capable of being erected from a groove; teeth strong, incisor-like, fixed; ventral rays I, 5; dorsal spines usually 9; anal spines 3. The species of this genus, owing to the marked changes taking place with age, are difficult to define in a key. In order to understand the relationship, it is necessary to compare specimens of like size.

KEY TO THE SPECIES.

a. Body deep, rhomboid, the depth 1.55 to 1.75 in length; snout 1.25 to 1.5 in head; longest dorsal spine shorter than snout; dorsal rays IX, 25 to 27; anal rays III, 24 to 26; caudal spine rather large, more than half the length of the eye in adult (160 mm.); color deep bluish black; base of caudal not paler than rest of body. *cæruleus*, p. 782.

aa. Body more elongate, at least when specimens of like size are compared; color lighter, brownish; base of caudal paler than rest of body, this condition most evident in young.

b. Longest dorsal spine equal to length of snout; anal rays III, 24 to 27; snout 1.5 to 2 in head; caudal spine very small, not more than half the length of eye in adult (160 mm.). *crestonis*, p. 782.

bb. Longest dorsal spine somewhat shorter than snout; anal rays III, 21 to 23; caudal spine large, exceeding half the length of eye in adult (160 mm.)

c. Caudal fin deeply concave, the upper lobe notably produced in adult; color uniform, without vertical bars in young; concave portion of caudal fin with a broad white margin. *bahianus*, p. 783.

cc. Caudal fin only moderately concave, the upper lobe not produced and not much longer than the lower; young with narrow vertical bars; concave portion of caudal fin with a very narrow white margin or none. *hepatus*, p. 784.

562. Acanthurus cœruleus Bloch & Schneider.

Acanthurus cœruleus Bloch & Schneider, Syst. Ichth., 1801, 214 (Carolina; Havana; Jamaica).

Acanthurus broussonetii Desmarest, Mém. Soc. Linn. Paris, II, 1823, 26 (Cuba).

Acanthurus brevis Poey, Memorias, II, 1860, 207 (Antilles; Havana).

Acronurus cœruleatus Poey, Enumeratio, 1875, 69 (Cuba; young).

Teuthis cœruleus Meek & Hoffman, Proc. Ac. Nat. Sci. Phila., 1884, 228; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1691.

Hepatus cœruleus Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 405 (Colon).

Head 3.2 to 3.5; depth 1.55 to 1.75; D. IX, 25 to 27; A. III, 24 to 26; scales about 160.

Body deep, compressed; anterior profile steep, straight or concave over snout; head short, deep; snout moderately in advance of forehead, its length 1.2 to 1.5 in head; eye 3 to 4.5; mouth small, terminal; teeth broad, with large serræ; scales very small, ctenoid; caudal spine variable in length, longer than eye in some specimens and notably shorter in others of like size; lateral line complete, curved with the back; dorsal fin long, the spines graduated, the longest somewhat shorter than snout; caudal fin deeply concave, both lobes produced, the upper only slightly longer than the lower; anal fin similar to soft part of the dorsal, the spines strong, the first more or less embedded, the third somewhat shorter than the longest dorsal spine; ventral fins reaching past origin of anal to base of first soft ray; pectoral fins moderate, equal to length of head.

Color deep bluish black, brownish on chest and abdomen; faint pale longitudinal lines noticeable on a few specimens; all the fins except pectorals bluish black; dorsal and anal with a narrow blue margin; caudal with a very narrow white margin; pectorals dusky at base, the distal parts yellowish; caudal spine orange.

We have over 50 specimens, ranging from 35 to 285 mm. in length. It is a food fish of some importance, living mostly on rocky bottom.

Known from Florida south to Brazil. Our specimens were taken at Toro Point, Colon and Porto Bello.

563. Acanthurus crestonis (Jordan & Starks).

Teuthis crestonis Jordan & Starks, in Jordan, Proc. Cal. Ac. Sci., 2nd Ser., V, 1895, 485, Pl. XLVII (Mazatlan); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1692, Pl. CCLVI, fig. 628; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 151 (Panama Bay); Evermann & Goldsborough, Proc. Biol. Soc. Wash., XXII, 1909, 103 (Taboga Island).

Head 2.7 to 3.7; depth 1.65 to 2.2; D. IX, 24 to 27; A. III, 23 to 26; scales about 150.

Body deep, compressed; anterior profile steep, convex; head short, deep; snout not greatly in advance of forehead, its length 1.5 to 2 in head; eye small, 2.75 to 4; mouth small, terminal; teeth broad, cutting edges and sides with prominent serræ; scales small, ctenoid; caudal spine small, half the eye in adult, proportionately shorter in young; lateral line curved like the back; dorsal fin long, the spines pungent, graduated, the longest equal to length of snout; caudal fin rather strongly concave, the upper lobe the longer, exceeding the length of head in adult; anal fin similar to soft dorsal, the spines strong, the first one very short, embedded in the skin; ventral fins shorter than the pectorals, the outer rays somewhat produced; pectoral fins moderate, equal to length of head.

Color in spirits dark brown, more or less blotched; base of caudal paler; dorsal, anal and ventrals very dark; caudal somewhat lighter, with a very narrow pale margin or none; distal three-fourths of pectorals pale (yellow in life).

This species is represented by 40 specimens, ranging from 40 to 155 mm. in length. It is very common in the rocky tide pools about Panama City. *A. crestonis* is very closely related to *A. matoides* recorded from the Hawaiian Islands and other points of the Western Pacific, from which it, however, seems to differ in the somewhat smaller caudal spine and in color. In 3 specimens of *A. matoides* from Honolulu pale longitudinal streaks appear on the upper part of sides, a condition which is not evident in our large series. It is used as food to a limited extent.

Known from Mazatlan to Panama. Our specimens were taken in tide pools at Naos Islands, Balboa and Panama and in the Panama City market.

564. **Acanthurus bahianus** Castelnau.

Acanthurus bahianus Castelnau, Anim. Nouv. Rares Amér. Sud, 1855, 24, Pl. XI, fig. 1 (Bahia).

Acanthurus tractus Poey, Memorias, II, 1860, 208 (Cuba).

Acronurus nigriculus Poey, Enumeratio, 1875, 69 (Cuba; larval form).

Acanthurus matoides Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 626 (not of Cuvier & Valenciennes).

Teuthis tractus Meek & Hoffman, Proc. Ac. Nat. Sci. Phila., 1884, 229.

Teuthis bahianus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1693, Pl. CCLVI, fig. 629; Breder, Zoologica, IV, Pt. 4, 1925, 156 (Caledonia Bay).

Hepatus bahianus Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 405 and 1917, 135 (Colon).

Head 3.2 to 3.6; depth 1.8 to 2.1; D. IX, 24 to 26; A. III, 21 to 23; scales about 150.

Body elongate, compressed; anterior profile moderately steep, convex; head short and deep; snout well in advance of forehead, its length 1.3 to 1.75 in head; eye 2.9 to 3.7; mouth small, the lower jaw slightly included; teeth broad, the entire margin with prominent serræ; scales small, ctenoid; caudal spine moderate, about three-fourths length of eye; lateral line curved with the back; dorsal fin long, the spines graduated, the longest slightly shorter than snout; caudal fin deeply concave, the upper lobe notably produced in adult but scarcely filamentous as described in current works; anal fin similar to soft portion of dorsal, the first spine very small, embedded, the other two very strong, the third one somewhat shorter than the longest dorsal spine; ventral fins moderate, reaching past origin of anal; pectoral fins rather long, equal to or slightly shorter than head.

Color uniform dark brown; the young with a somewhat lighter area at base of caudal; dorsal, anal and ventrals very dark; caudal somewhat lighter, with a white margin, broadest and most conspicuous on the shortest rays; pectoral fins yellowish in life.

This species is the rarest of the three which were taken on the Atlantic coast of Panama. We have 30 specimens ranging from 45 to 215 mm. in length. The young are separated from the young of *A. cœruleus* with difficulty. It inhabits rocky shores.

Known from North Carolina south to Brazil. Our specimens are from Toro Point, Colon and Porto Bello.

565. **Acanthurus hepatus** (Linnæus).

Teuthis hepatus Linnæus, Syst. Nat., Ed. XII, 1766, 507 (Carolina); Meek & Hoffman, Proc. Ac. Nat. Sci. Phila., 1884, 229; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1691.

Chætodon chirurgus Bloch, Naturg. Ausl. Fische, III, 1787, 99, Pl. CCVIII (Martinique; on a drawing by Plumier).

Acanthurus hepatus Bloch & Schneider, Syst. Ichth., 1801, 211 (in part).

Acanthurus chirurgus Cuvier & Valenciennes, Hist. Nat. Poiss, X, 1835, 168.

Acanthurus phlebotomus Cuvier & Valenciennes, Hist. Nat. Poiss, X, 1835, 176 (Martinique, Brazil, Havana, New York).

Acronurus fuscus Gronow, Cat. Fish, 1854, 191 (same type as *T. hepatus* Linnæus).

Acronurus carneus Poey, Syn. Pisc. Cub., 1868, 350 (Cuba).

Acanthurus nigricans Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1882 (1883), 941 (not *Chætodon nigricans* Linnæus).

Hepatus hepatus Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 405 and 1917, 135 (Colon).

Head 2.8 to 3.6; depth 1.75 to 2.1; D. IX, 23 to 25; A. III, 22 or 23; scales about 140.

Body moderately elongate, compressed; the anterior profile rather steep, gently convex; head short, deep; the snout well in advance of forehead, its length 1.4 to 1.75 in head; eye 2.5 to 4; mouth small, the lower jaw included; teeth broad, the entire margin strongly serrate; scales small, ctenoid; caudal spine rather large, equal to diameter of eye in adult (220 mm.), proportionately shorter in young; lateral line curved with the back; dorsal fin long, the spines graduated, the longest one a little shorter than the snout; caudal fin only moderately concave, the upper lobe not much longer than the lower; anal fin similar to soft part of dorsal, the spines strong, the first short but scarcely embedded, the third only slightly shorter than the longest dorsal spine; ventral fins reaching well beyond origin of anal, nearly to base of first soft ray; pectoral fins moderate, equal to length of head.

Color in adult uniform brownish; young often with narrow dark cross-bars, and the base of caudal yellowish green; a bluish black blotch surrounding caudal spine; dorsal, anal and ventrals bluish black; caudal somewhat lighter, with a very narrow yellowish margin; pectoral yellow, except at base which is dusky.

This species, although its size is rather small, is frequently seen in the market. We have at hand over 100 specimens, ranging from 35 to 220 mm. in length, taken mainly on rocky bottom. Our 220 mm. specimen is one of the largest seen.

Known from Massachusetts south to Brazil. The species is also recorded from Ashantee, West Africa. Our specimens are from Toro Point, Colon and Porto Bello.

203. Genus **Xesurus** Jordan & Evermann.

Xesurus Jordan & Evermann, Rept. U. S. Fish Comm., XXI, 1895 (1896), 421 (type *Prionurus punctatus* Gill).

This genus has the caudal peduncle armed with 3 immovable bony shields, placed in a straight line; teeth each 5-lobed. A single species of this genus is known from Panama. The species is based on 2 large specimens obtained at Panama City by Prof. C. H. Gilbert and assistants in 1896. It was not seen by us. The original description follows:

566. Xesurus hopkinsi Gilbert & Starks.

Xesurus hopkinsi Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 155, Pl. XXV, fig. 48 (Panama Bay).

"The outlines of the body are evenly curved. The snout projects but slightly as compared with the other species, and the upper anterior outline is shallowly concave. From before eye to dorsal, the profile is regularly rounded and without a projection at nape.

"Dorsal VIII, 26 or 27; anal III, 23. The head is smaller than in the other species, 26 or 27 hundredths of the length. In seven specimens of *X. punctatus*, the head averages 31 1/7 hundredths of the length; in three specimens of *laticlavius*, 31⅓ hundredths; in *clarionis*, 30 hundredths. The mouth is smaller; the maxillary forms but 6¼ hundredths of the length (in *punctatus*, 7 5/7 hundredths; in *laticlavius*, 8⅖ hundredths; in *clarionis*, 8 hundredths). The teeth are much smaller, though they number the same as in the other species, 8 or 9 on each side of the upper jaw. The eye is smaller, 4 or 4½ in the snout, 5 hundredths of the length (in *punctatus* 6 5/7 hundredths; in *laticlavius*, 7⅚ hundredths; in *clarionis*, 6½ hundredths).

"The pectoral is broad and rounded at its tip, reaching to above the base of the second anal spine, when forced into a horizontal position. It seems to incline obliquely upward in its normal position. The ventrals nearly reach the first anal spine, and are about two-thirds the length of the pectorals. The dorsal and anal are as in related species. In the larger specimen, the first dorsal spine has become almost entirely concealed beneath the skin, the first anal spine wholly concealed.

"The posterior part of the body is rather thickly covered with sharp spines, the bases of which are expanded as rough plates. The spines are somewhat inclined forward and are occasionally bifid (some specimens of other species have scattered rough plates which sometimes bear low sharp keels, but never high spines). The three bony shields on the caudal peduncle bear thick blunt spines, their points broad and smooth, as though worn.

"Color light slaty on lower parts, dark above. One specimen is faintly spotted with black on nape and opercles."

This species is known only from 2 large specimens taken at Panama City, respectively 410 and 430 mm. in length, upon which the above description by Gilbert & Starks is based.

Family LXVI. Balistidæ.

THE TRIGGER-FISHES.

Body usually more or less ovate, considerably compressed; snout long; eye small, placed high; mouth small, usually terminal; jaws short but strong; teeth in the jaws in a single series, more or less incisor-like; gill-openings mere slits; preopercular bones externally not evident; body covered with modified scales, more or less plate-like in structure and bearing spines or bony tubercles; skin leathery; dorsal fins 2, the first spine highest, very strong; ventral fins replaced by a single stout spine attached to the enlarged pubic bone. Only 2 genera are represented in the waters of Panama.

KEY TO THE GENERA.

a. Several enlarged bony plates behind gill-slit. *Balistes*, p. 787.
aa. Gill-slit surrounded by ordinary scales, not as above. *Canthidermis*, p. 793.

204. Genus **Balistes** Linnæus.

Balistes Linnæus, Syst. Nat., Ed. X, 1758, 327 (type *Balistes vetula* Linnæus).

Capriscus Klein, Neuer Schauplatz, etc., V, 1777, 427 (type *Balistes capriscus* Gmelin).

Pachynathus Swainson, Nat. Hist. & Class. Fish., II, 1839, 326 (type *Pachynathus triangularis* Swainson; name preoccupied).

Chalisoma Swainson, Nat. Hist. & Class. Fish., II, 1839, 325 (type *Balistes pulcherrimus* Lesson=*Balistes vetula* Linnæus).

Sufflamen Jordan, Copeia, Apr. 12, 1916, 27 (type *Balistes capistratus* Shaw; substitute for *Pachynathus*, preoccupied).

Body usually deep, compressed; snout long; eye small, placed high; mouth small, usually terminal; gill-opening an oblique slit, with enlarged bony scutes behind it; teeth in the jaws irregular, usually notched and the anterior cusp enlarged; lateral line more or less developed, undulating, often obsolete in adult; scales plate-like, rough, usually bearing spinules; first dorsal with 3 spines, the anterior one much enlarged, which sets stiff and erect when the second spine is erect, but which may be laid back, if the second is deflexed, hence the name "trigger fishes"; second dorsal and anal long, usually similar; the ventral fins represented by a spine, attached to the abdomen by a spinous flap. Four species of this genus occur in the Panama collection, but several others will doubtless be taken there in time.

KEY TO THE SPECIES.

a. Cheeks with several short, horizontal rows of enlarged scales; D. III-30 to 33; A. 27 to 29; scales 60 to 64. *verres,* p. 788.

aa. Cheeks with oblique rows of scales which are not enlarged; second dorsal usually with fewer than 30 rays.

b. Scales small, 65 to 76 in lateral series; D. III-26 to 28; A. 24 to 26. *polylepis,* p. 790.

bb. Scales larger, fewer than 65 in a lateral series.

c. A naked area about the mouth, small in young but large in adult; scales below pectoral fins not enlarged; preorbital groove poorly developed; D. III-25 to 27; A. 23 to 25; scales 57 to 60. *naufragium,* p. 790.

cc. Naked area about mouth wanting, the snout closely scaled; preorbital groove well developed.

d. Head without prominent bands or stripes; sides and fins without conspicuous roundish blue black spots; scales below pectoral fins more or less enlarged; outer caudal rays not greatly produced, never filamentous; D. III-27 to 29; A. 23 to 26; scales 54 to 62. *carolinensis,* p. 791.

dd. Head with prominent dark bars and stripes; the outer caudal rays much produced in adult, filamentous; D. III-29 or 30; A. 26 to 28; scales 60 to 62 *vetula* p. 792.

ddd. Body and dorsal and anal fins covered with roundish blue black spots. *forcipatus,* p. 793.

567. Balistes verres Gilbert & Starks.

Pachynathus capistratus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1704 (in part); Jordan & McGregor, Rept. U. S. Fish Comm., XXIV, 1898 (1899), 280 (Clarion and Socorro islands; not of Shaw).

Balistes verres Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 153, Pl. XXVI, fig. 49 (Panama Bay); Snodgrass & Heller, Proc. Wash. Ac. Sci., VI, 1904 (1905), 406 (Galapagos Islands).

Balistes capistratus Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 163 (Acapulco; Perico and Taboguilla islands).

Head to upper angle of gill-opening 2.7 to 2.9; depth 1.7 to 2; D. III-30 to 33; A. 27 to 29; scales 60 to 64.

Body deep, compressed; profile straight or slightly concave in advance of eyes; snout long, 1.2 to 1.4 in head; eye 4.8 to 6.15; preorbital groove present; mouth small, terminal; gill-opening about 2 times length of eye in adult (265 mm.), equal to length of eye in young; teeth in jaws moderate, notched, with sharp, oblique margins; body closely scaled, no naked area about the mouth, 6 longitudinal series of scales on cheeks, scales on sides and posterior part of the body each with a small antrorse spine; an irregular row of pores extending from eye backward nearly to soft dorsal; ventral spine broad, movable, provided with spinules at apex; first dorsal with 3 spines, the first one strong, with upward projecting barbs on anterior margin, its length 1.75 to 1.8 in head; second dorsal and anal similar in young; the former slightly elevated in adult, the lobes not produced, with nearly straight margin in young; pectoral fins short, 3.1 to 3.2 in head.

Color of preserved specimens, dark above, yellowish below; a scarcely discernable pale streak from angle of mouth backward across the cheek present in one of our specimens, wholly wanting in others. This streak is very evident on some specimens from the west coast of America, which we have examined in the National Museum. Dorsal, anal and pectorals plain or dusky; caudal fin very dark.

This species is represented by 8 specimens, ranging from 145 to 165 mm. in length. We have for comparison several specimens from the Hawaiian Islands, and from Acapulco, and the Galapagos Islands. We have also examined specimens from Panama Bay identified as *B. capistratus* by Kendall & Radcliffe. We find that all the specimens taken on or off the American coast can be readily distinguished from the Hawaiian specimens by the smaller scales, there being from 60 to 64 in a lateral series in the former, while in the latter there are only 49 to 54. In the adult of the American specimens the dorsal fin is anteriorly somewhat elevated, which is not true of the Hawaiian representatives. In comparing specimens of like size, it will also be seen that the margin of the caudal fin in the American specimens is more deeply concave. It is, therefore, quite certain that all records of *B. capistratus* based on American specimens should be referred to *B. verres*.

Known from Mazatlan south to Panama Bay and the Galapagos Islands. Our specimens are from the rocky shores of small islands near the Pacific entrance of the Panama Canal.

568. Balistes polylepis Steindachner.

Balistes polylepis Steindachner, (Sitzb. k. Ak. Wiss. Wien, LXXIV) Ichth. Beitr., V, 1876, 21 (Magdalena Bay, Mazatlan; Acapulco); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1700; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 152 (Panama Bay).

Head to upper angle of gill-slit 2.7 to 2.95; depth 1.6 to 1.9; D. III-26 to 28; A. 24 to 26; scales 65 to 76, difficult to enumerate in small specimens.

Body deep, proportionately deeper in young than in adult; anterior profile straight or slightly concave over snout; the interorbital region somewhat swollen; snout long, 1.25 to 1.6 in head; eye 2.9 to 5.6; preorbital groove strongly developed; mouth small, terminal; gill-opening 1.75 times the length of the eye in specimens 430 mm. in length, equal to diameter of eye in specimens 70 mm. in length; teeth strong, notched, the anterior cusp very large; body closely scaled; no naked area about the mouth; a patch of short spines behind angle of mouth; the young rougher than the adult; young with a row of pores beginning at angle of mouth extending to under posterior part of eye there meeting a branch having its origin on the chin, from thence continued as a single row running upward back of the eye there meeting two other branches, one from the upper lip backward over eye, and the other crossing nape just in front of dorsal spine, the row then continued nearly to origin of second dorsal then curving abruptly downward and backward to below median line of body, then again curving upward to median line of caudal peduncle; these lines obsolete in adult (430 mm. in length); ventral spine strong, provided with spinules; first dorsal with three spines, its origin just behind eye, the first spine strong, only moderately rough on anterior margin, 1.25 to 1.95 in head; dorsal and anal similar, anteriorly elevated in adult; caudal fin rounded in young, deeply concave with the outer rays much produced in adult; pectoral fins short, 2.3 to 2.65 in head.

Color in alcohol dusky or brownish; very young, of 40 mm. and less in length, with dark spots on sides; fins unmarked, usually light brown in adult, pale in young.

This species is represented by 73 specimens ranging from 20 to 430 mm. in length. It is used as food only to a very limited extent.

Known from Lower California to Peru. Our specimens are from Chame Point, Taboga Island, Balboa and the Panama City market.

569. Balistes naufragium Jordan & Starks.

Balistes naufragium Jordan & Starks, Proc. Cal. Ac. Sci., 2nd Ser., V, 1895, 488 (Mazatlan); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1700; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 152 (Panama Bay); Starks, Proc. U. S. Nat. Mus., 1906, 798 (Guayaquil, Ecuador); Evermann & Goldsborough, Proc. Biol. Soc. Wash., XXII, 1909, 103 (Taboga Island); Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 163 (Perico Island, Panama Bay).

Head to upper angle of gill-slit 2.55 to 3; depth 1.7 to 1.9; D. III-25 to 27; A. 23 to 25; scales 57 to 60.

Body deep, moderately compressed; anterior profile nearly straight over snout, convex over eyes, very large specimens (550 mm.) with nuchal hump; snout long, 1.2 to 1.3 in head; eye 4.45 to 6.75; preorbital groove poorly developed; mouth terminal; the lips thickened in adult; gill-slit 2 times length of diameter of the eye in adult (550 mm.), proportionately much shorter in young; teeth very strong, notched, the anterior cusp much enlarged; body with rather large scales; a naked area about the mouth which increases in size with age; lateral line in young as in *B. polylepis,* obsolete in adult (550 mm.); ventral spine very strong, rough; origin of the first dorsal just behind vertical from posterior margin of eye, the first spine very strong, with prominent tubercles, its length 1.5 to 2.1 in head; second dorsal and anal dissimilar, the former anteriorly more elevated than the latter; caudal fin in small specimens (195 mm.) double concave, with the lower rays shorter than the middle rays, the outer rays more strongly produced, the lower ones longer than the middle rays in adult; pectoral fins short, 2.15 to 2.5 in head.

Color in alcohol very dark brown, the fins only slightly paler than the body.

This species is represented in the present collection by 12 specimens, ranging from 195 to 550 mm. in length. It is used as food to a very limited extent.

Known from Mazatlan, Mexico, south to Guayaquil, Ecuador. Our specimens are from Naos Island, Balboa and the Panama City market.

570. **Balistes carolinensis** Gmelin.

Balistes carolinensis Gmelin, Syst. Nat., I, Part III, 1789, 1468 (Carolina); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1701, Pl. CCLVIII, fig. 632.

Balistes capriscus Gmelin, Syst. Nat., I, Part III, 1788, 1471 (Indian and American oceans).

Balistes caprinus Valenciennes, in Webb & Berthelot, Hist. Nat. Iles Canaries, II, Pt. II, 1844, 94, Pl. XVI (Canaries).

Balistes fuliginosus De Kay, Fauna N. Y., Fishes, 1842, 339, Pl. LVII, fig. 188 (New York).

Head to upper angle of gill-slit 2.8 to 3.1; depth 1.7 to 2.25; D. III-27 to 29; A. 23 to 26; scales 54 to 62.

This species was not seen at Panama. It is rather closely related to *B. polylepis,* from which it differs in having larger and rougher scales. In comparing specimens of like size, it will also be seen that the anal fin in the present species is less strongly elevated.

From *B. naufragium* it may readily be distinguished by the enlarged scales below and behind the pectorals and by having the snout completely scaled, while in *B. naufragium* there is a larger naked area about the mouth.

A widely distributed species, known from both shores of the warmer waters of the Atlantic; also recorded from the Indian Ocean.

571. **Balistes vetula** Linnæus.

Balistes vetula Linnæus, Syst. Nat., Ed. X, 1758, 329 (Ascension Islands; after *B. vetula* of Osbeck); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1703; Starks, Leland Stanford Jr. Univ. Pub., Univ. Ser., 1913, 63 (Natal, Brazil); Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 411 (Panama).

Balistes bellus Walbaum, Artedi Piscium, III, 1792, 467 (West Indies).

Chalisoma velata Swainson, Nat. Hist. & Class. Fish., II, 1839, 325.

Balistes equestris Gronow, Cat. Fish, 1854, 31 (American Seas).

Head to upper angle of gill-slit 2.6 to 2.75; depth 1.7 to 2; D. III-29 or 30; A. 26 to 28; scales 60 to 62.

Body deep, compressed; anterior profile nearly straight over snout, convex over eyes; snout long, 1.35 to 1.45 in head; eye 3.5 to 4.7; preorbital groove present; mouth terminal; the lips not thickened; gill-slit equal to diameter of eye in adult (250 mm.), shorter than eye in young; teeth moderate; scales of moderate size, no naked area about mouth; lateral line in young as in *B. polylepis,* obsolete in adult (250 mm.); ventral spine broad, with many spinules; origin of first dorsal just behind vertical from posterior margin of eye, the first spine 1.7 to 1.95 in head; second dorsal and anal more or less dissimilar, the former being more strongly elevated anteriorly than the latter; caudal fin deeply concave, the outer rays notably produced, even in small specimens (110 mm.), filamentous in adult (250 mm.); pectoral fins short, 2.3 to 2.7 in head.

Color in alcohol brownish; sides of head below eye with two heavy dark bands, the lower extending from upper lip to the throat, the upper from above the snout to below base of pectoral; a narrow dark line curved like the bands extending from above snout to above base of pectoral; several similar lines radiating from eye; fins unmarked in spirits.

This species was not seen by us at Panama, but it is recorded from there by Fowler (*l.c.*) and more recently from Caledonia Bay by Breder (Zoologica, IV, Pt. 4, 1925, 156). It is here described from specimens, ranging in length from 110 to 250 mm., from Cuba, Jamaica and Bahia, Brazil.

Known from Massachusetts south to Brazil; also recorded from the Azores and Ascension Island.

572. Balistes forcipatus Gmelin.

Balistes forcipatus Gmelin, Syst. Nat., I, Pt. III, 1789, 1472 (Brazil); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1702.

Balistes punctatus Gmelin, Syst. Nat., I, Pt. III, 1789, 1472.

Balistes spilotopterygius Walbaum, Artedi Piscium, III, 1792, 455 (Brazil).

Balistes guttatus Walbaum, Artedi Piscium, III, 1792, 467 (St. Vincent).

Balistes ciliaris Bloch & Schneider, Syst. Ichth., 1801, 471 (Brazil).

Balistes liberiensis Steindachner, (Sitzb. k. Ak. Wiss. Wien, LV) Ichth. Notizen, IV, 1867, 9 (Monrovia).

Balistes powellii Cope, Proc. Ac. Nat. Sci. Phila., 1870, 120 (Newport, R. I.; young).

Balistes moribundus Cope, Trans. Amer. Philo. Soc. Phila., XIV, 1871, 479 (St. Martins; young).

This species was not seen by us. It apparently differs from *B. carolinensis* only in coloration, having the body and the dorsal and anal fins covered with roundish blue black spots.

Known from both coasts of the tropical Atlantic. The species is included because it is recorded from localities both north and south of Panama, thus coming within the scope of the present work.

205. Genus **Canthidermis** Swainson.

Canthidermis Swainson, Nat. Hist. & Class. Fish., II, 1839, 325 (type *Balistes angulosus* Quoy & Gaimard).

Body somewhat elongate; head completely scaled; a preorbital groove present; gill-opening surrounded by ordinary scales, there being no enlarged bony scutes behind it as in *Balistes;* dorsal spines 3. A single species, which is from the Pacific coast, occurs in the Panama collection. We have included in our discussion *C. maculatus* from the Atlantic Ocean, which probably comes within the scope of the present work, but the relationship of which we do not understand and, therefore, no attempt is being made to give a key to the species.

573. Canthidermis rotundatus (Marion de Procé).

Balistes rotundatus Marion de Procé, Bull. Soc. Philo. Paris, 1822, 130 (Manila).

Balistes azureus Lesson, Voy. Coquille, Zoöl., II, 1831, 121, Pl. X, fig. 2.

Balistes angulosus Quoy & Gaimard, in Freycinet, Voy. Uranie et Physicienne, Zool., 1824, 210 (Hawaiian Islands).

Balistes oculatus Gray, Illus. Ind. Zoöl., I, 1832, Pl. XC, fig. 1 (India).

Balistes senticosus Richardson, in Adams, Zoöl. Voy. Samarang, Fish., 1848, 23, Pl. IX, figs. 5-8 (China Sea).

Balistes maculatus Günther, Cat. Fish. Brit. Mus., VIII, 1870, 213 (Cape of Good Hope, Pinang, Borneo, Sandalwood Island, China, Japan; in part, not of Bloch).

Canthidermis rotundatus Jordan & Fowler, Proc. U. S. Nat. Mus., 1903, 260.

Canthidermis angulosus Jordan & Evermann, Bull. U. S. Fish Comm., XXIII, Pt. I, 1903 (1905), 415; Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 164 (Lat. 7°, 15′ N.; Long. 82°, 8′ W. & Lat. 17°, 20′ N.; Long. 101°, 32′ W.).

Head to upper angle of gill-slit 2.35 to 2.75; depth 1.5 to 1.95; D. III-20 to 24; A. 20 to 22; scales 41 to 46.

Body deep, moderately compressed; profile slightly concave over snout, convex at nape; snout moderate, 1.75 to 2 in head; eye 2.8 to 3.7; preorbital groove present; interorbital region broad, with prominent ridges over eyes in young; mouth small, terminal; gill-slit notably shorter than the eye; teeth notched, with rather sharp cutting edges; scales moderate, rough, posteriorly slightly keeled; no naked area about the mouth; lateral line present but indistinct; ventral spine strong, provided with spinules; origin of first dorsal over gill-opening, the first spine strong, rough on the anterior margin, 1.9 to 2.4 in head; second dorsal and anal of equal length, the latter more strongly elevated anteriorly; caudal fin very short, rounded; pectoral fins short, 2.75 to 3 in head.

Color brownish to black; sides usually with white spots; fins in very small examples colorless; colored like the body in larger specimens, but without white spots.

The Panama collection contains 19 specimens, ranging from 17 to 72 mm. in length. Besides these there are three other small specimens from Panama at hand, belonging to the U. S. National Museum, one from Taboga Island, taken by August Busck, and two specimens taken by the Albatross off the coast of Panama. We also have at hand three specimens from Japan with which our material agrees perfectly. For this reason we are using the older name, *rotundatus*, given to a specimen from Manila, believing that the East Indian, Hawaiian and American representatives are all identical.

This species, as here understood, is widely distributed throughout the warm parts of the Pacific and Indian oceans, having been recorded from the western Pacific, from the Hawaiian Islands and Panama, and also from Peru, if *Balistes adspersus* Tschudi too proves to be identical with the present species. Our specimens were collected at Chame Point by Robert Tweedlie.

574. **Canthidermis maculatus** (Bloch).

Balistes maculatus Bloch, Naturg. Ausl. Fische, II, 1786, 25, Pl. CLI (West Indies); Günther, Cat. Fish. Brit. Mus., VIII, 1870, 213 (in part); Day, Fishes of India, 1878, 688 (in part).

Balistes americanus Gmelin, Syst. Nat., I, Pt. III, 1789, 1473 (America).

Balistes macropterus Walbaum, Artedi Piscium, III, 1792, 465 (America).

?Balistes oculatus Gray, Illus. Ind. Zoöl., I, 1832, Pl. XC, fig. 1 (India).

Balistes rufus Gronow, Cat. Fish, 1854, 36 (American Ocean).

Balistes longus Gronow, Cat. Fish, 1854, 37 (American Ocean).

Balistes melanopterus Cope, Trans. Amer. Philo. Soc. Phila., XIV, 1871, 478 (Darien).

Canthidermis maculatus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1706.

There are no specimens of this species available, and we are unable to understand the affinities of the species from the scant descriptions which are at hand. If Bloch's figure is accurate, the spots on sides are much larger in the present species than in *C. rotundatus*. Bloch's figure represents the dorsal as being higher than the anal, while in the specimens of *C. rotundatus* which are at hand the reverse is true. The caudal fin is represented as angulated, while in specimens at hand it is rounded. Some of these differences may be due to age, i. e., Bloch's figure may be based on a large specimen, while we have only small specimens of *C. rotundatus.* It is not unlikely that Günther (Cat. Fish. Brit. Mus., VIII, 1870, p. 213) was right in combining this species with *C. rotundatus.*

We follow Jordan & Evermann in placing in the synonomy of this species *Balistes melanopterus* Cope, type locality Darien. While Cope does not state whether his specimen was from the Atlantic or the Pacific side of the Isthmus, we infer that it was from the former, because other material upon which he reported in the same paper was from the Atlantic side.

This species, as here understood, is known from the warmer waters of the Atlantic; on the American side from the West Indies to Darien, the Panama record being based upon *Balistes melanopterus* Cope.

Family LXVII. **Monacanthidæ.**

THE FILE-FISHES.

Body much compressed, rather deep; mouth small, usually terminal; teeth incisor-like, in 2 series in upper jaw; gill-opening a mere slit; lateral line absent; scales rudimentary, bearing spines; first dorsal composed of a single spine, or occasionally of a rudimentary spine behind the first; second dorsal and anal similar; caudal fin long or short, pointed or rounded; ventral fins represented by a fixed or movable spine attached by the pelvic bone or entirely wanting. Herbiverous fishes, with rough skin. Most of the species are small and none are of value as food.

KEY TO THE GENERA.

a. Pelvic bone with a terminal spine projecting through the skin; gill-opening short, equal to or shorter than eye in small or medium sized specimens.

b. Dorsal spine situated over posterior part of eye, posteriorly armed with 2 series of barbs. *Monacanthus,* p. 796.

bb. Dorsal spine situated over or slightly in advance of middle of eye, without barbs. *Cantherines,* p. 800.

aa. Pelvic bone without a terminal spine; dorsal spine without barbs. *Alutera,* p. 801.

206. Genus **Monacanthus** Oken.

Monacanthus Oken, Isis, 1817, 1183 (type *Balistes chinensis* Bloch).

Trichoderma Swainson, Nat. Hist. & Class. Fish., II, 1839, 328 (type *Balistes scapus* Lacépède).

Stephanolepis Gill, Proc. Ac. Nat. Sci. Phila., 1861, 78 (type *Monacanthus setifer* Bennett).

Body short, deep, and much compressed; snout long; mouth small; teeth broad, with sharp cutting edges, a double series in upper jaw; gill-opening an oblique slit, scarcely as long as eye; a strong ventral spine present, projecting through the skin and attached to the abdomen by a flap; first dorsal composed of a single spine, bearing two series of barbs posteriorly and situated over part of eye; caudal fin not longer than head, rounded.

KEY TO THE SPECIES.

a. Body short and deep, the depth at vertical from vent usually less than 2 in length to base of caudal; ventral flap never extending beyond tip of ventral spine; caudal peduncle at sides with small spines like the rest of the body, not with prominent recurved spines and bristles.

b. Dorsal with 31 to 35 rays; anal with 31 to 35 rays; color variable from plain grass-green to very dark green and marbled with black. *hispidus*, p. 797.

bb. Dorsal with 27 to 29 rays; anal with 27 to 29 rays; color green mottled with black; sides with elongate black spots so arranged as to form more or less distinct longitudinal lines. *oppositus*, p. 798.

aa. Body somewhat more elongate, the depth at vertical from vent usually more than 2 in length to base of caudal; ventral flap usually extending beyond tip of ventral spine; caudal peduncle at sides with the spines less closely placed, enlarged and recurved in the adult. *ciliatus*, p. 799.

575. **Monacanthus hispidus** (Linnæus).

Balistes hispidus Linnæus, Syst. Nat., Ed. XII, 1766, 405 (Carolina).

Balistes broccus Mitchill, Trans. Lit. & Philo. Soc. N. Y., I, 1815, 467 (New York).

Monacanthus filamentosus Valenciennes, in Webb & Berthelot, Hist. Nat. Iles Canaries, II, Pt. II, 1844, 95 (Canaries; adult).

Monacanthus gallinula Valenciennes, in Webb & Berthelot, Hist. Nat. Iles Canaries, II, Pt. II, 1844, 95 (Canaries; young).

Monacanthus varius Ranzani, Novi Comment. Ac. Sci. Inst. Bonon., V, 1842, 6, Pl. II (Brazil).

Monocanthus (!) massachusettensis De Kay, Fauna N. Y., Fishes, 1842, 336, Pl. LVII, fig. 187 (Massachusetts Bay).

Monocanthus (!) setifer De Kay, Fauna N. Y., Fishes, 1842, 337, Pl. LIX, fig. 194 (New York Harbor; not of Bennett).

Monacanthus signifer Storer, Memoir. Amer. Ac., New Ser., II, 1846, 245 (Massachusetts; substitute for *setifer*, preoccupied).

Monacanthus auriga Lowe, Proc. Zoöl. Soc. Lond., 1850, 253 (Madeira).

Stephanolepis setifer Gill, Proc. Ac. Nat. Sci. Phila., 1861, 78.

Monacanthus broccus Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1882 (1883), 856.

Monacanthus hispidus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1715, Pl. CCLIX, fig. 635; Starks, Leland Stanford Jr. Univ. Pub., Univ. Ser., 1913, 63 (Natal, Brazil).

This fish was not taken at Panama, but it doubtless occurs there, as it is recorded from localities both north and south of the Isthmus. The difference between this species and *M. oppositus* is shown in the key to the species of this genus.

Known from Massachusetts south to Brazil.

576. **Monacanthus oppositus** Poey.

Monacanthus oppositus Poey, Memorias, II, 1861, 331 (Cuba); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1716.

Head to upper angle of gill-slit 2.7 to 3; depth at vertical from vent 1.75 to 2; D. 27 to 29; A. 27 to 29.

Body short and deep; profile straight or slightly concave in advance of eyes; snout long, 1.35 to 1.65 in head; eye placed high, 2.6 to 3.6; mouth small, terminal; gill-opening a small oblique slit, equal to or shorter than eye; teeth in the jaws broad, with sharp cutting edges; body densely covered with small clusters of bristles; a prominent ventral spine present, beyond which the ventral flap does not extend; first dorsal composed of a single spine, placed over posterior part of eye and bearing a double row of barbs posteriorly, its length scarcely exceeding the length of snout; second dorsal and anal similar, and of equal length; caudal fin convex; pectoral fin small, 2.25 to 2.85 in head.

Color in life green, mottled with black; sides with elongate black spots, forming more or less distinct longitudinal lines; dorsal and anal plain translucent, or slightly tinged with yellow; middle caudal rays dark green, the outer rays yellowish.

This species is common on the Atlantic coast of Panama. Our collection contains over 200 specimens, ranging from 25 to 90 mm. in length. It is closely related to *M. hispidus,* from which it differs in the shorter dorsal and anal fins and in color.

Previously recorded only from Cuba and Cartagena, Colombia. Our specimens are all from Fox Bay, Colon.

577. **Monacanthus ciliatus** (Mitchill).

Balistes ciliatus Mitchill, Amer. Monthly Mag., II, 1818, 326 (Bahama Straits).

Monacanthus piraaca Kner, Reise Fregatte Novara, Fische, 1867, 396 (Rio de Janeiro).

Monacanthus occidentalis Günther, Cat. Fish. Brit. Mus., VIII, 1870, 237 (Puerto Cabello).

Monacanthus davidsonii Cope, Trans. Amer. Philo. Soc. Phila., XIV, 1871, 476 (Florida Reef).

Monacanthus ciliatus Jordan, Proc. U. S. Nat. Mus., 1884, 145; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1714, Pl. CCLIX, fig. 634; Starks, Leland Stanford Jr. Univ. Pub., Univ. Ser., 1913, 63 (Natal, Brazil); Breder, Zoologica, IV, Pt. 4, 1925, 157 (Caledonia Bay).

Head to upper angle of gill-slit 2.9 to 3.4; depth at vertical from vent 1.95 to 2.6; D. 30 to 34; A. 30 to 33.

Body strongly compressed, of moderate depth; profile over snout notably concave; snout long, 1.3 to 1.5 in head; eye placed high, 3.3 to 3.8; mouth slightly superior, the lower jaw a little longer than the upper; gill-opening a small oblique slit, shorter than eye; teeth in the jaws broad, with sharp cutting edges; body covered with short spines, these less numerous at base of caudal; adult with recurved spines and bristles at base of caudal; a prominent ventral spine present; ventral flap variously developed, usually extending beyond the spine even in young; first dorsal composed of a single spine placed over posterior part of eye and bearing two series of barbs posteriorly, its length about equal to snout; second dorsal and anal similar; caudal fin not longer than snout, convex at all ages; pectoral fins short, 2.7 to 3.3 in head.

Color in life of a specimen 84 mm. in length, green, sides with four (2 distinct) dark longitudinal bands; ventral flap green, with an orange margin; dorsal and anal red; caudal dark green, with 2 black cross-bars. The color is variable and the dark longitudinal bands described in the above specimen are usually not present.

This species is represented in the Panama collection by 14 specimens, ranging from 30 to 85 mm. in length. The development of the ventral flap is variable. In some specimens even of small size, 50 mm.

in length, it is well developed and extends much beyond the ventral spine, in others much longer it is often less strongly developed. The development of the bristles on caudal peduncle is also very variable among individuals. This species differs from *M. hispidus:* a. In the shallower and less robust body, a difference which is, however, only apparent when specimens of like size are compared. b. The greater development of the ventral flap, in the present species, usually distinguishes the two quite readily, but at times this variable character also fails among the young. c. The longer and less densely placed spines on the caudal peduncle. Although this character also varies, it appears to be of value. In very young this character is often evident only as a bare area at the base of the caudal. It is from this area that later the largest and strongest recurved spines arise.

Recorded from North Carolina, Florida, the West Indies, Caledonia Bay, and south to Brazil. Our specimens are from Fox Bay, Colon.

207. Genus **Cantherines** Swainson.

Cantherines Swainson, Nat. Hist. & Class. Fish., II 1839, 327 (type *Monacanthus nasutus* Quoy & Gaimard).

Liomonacanthus Bleeker, Nederl. Tijdsch. Dierk., III, 1866, 13 (type *Monacanthus pardalis* Rüppell).

This genus is distinguished from *Monacanthus* by the absence of barbs on the dorsal spine and by the more anterior position of the dorsal spine, which is placed over or slightly in advance of middle of eye.

578. **Cantherines pullus** (Ranzani).

Monacanthus pullus Ranzani, Novi Comment. Ac. Sci. Inst. Bonon., V, 1842, 4, Pl. I (Brazil).

Monacanthus macrocerus Hollard, Ann. Sci. Nat., 4th Ser., II, 1854, 327, Pl. XII, fig. 1 (Bahia).

Monacanthus ruppelii Castelnau, Anim. Nouv. Rares Amér. Sud, 1855, 97, Pl. XLVII, fig. 2 (Bahia).

Monacanthus stratus Poey, Memorias, II, 1861, 329 (Cuba).

Monacanthus irroratus Poey, Memorias, II, 1861, 330 (Cuba).

Monacanthus parraianus Poey, Proc. Ac. Nat. Sci. Phila., 1863, 185 (Cuba).

Monacanthus punctatus Poey, Syn. Pisc. Cub., 1868, 437 (Cuba).

Monacanthus pardalis Günther, Cat. Fish. Brit. Mus., VIII, 1870, 230 (in part).

Cantherines pullus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1713.

Head to upper angle of gill-opening 2.85 to 3.25; depth at vertical from vent 2.1 to 2.3; D. 35 or 36; A. 32 to 34.

Body moderately deep; profile concave in advance of eyes; snout long, 1.2 in head; eye placed high, 3.6 to 4.5; mouth small, terminal or slightly superior; gill-opening an oblique slit, equal to or longer than eye in specimens 100 mm. or more in length; teeth in the jaws rather broad, with sharp cutting edges; body densely covered with small bristles; a prominent ventral spine present, beyond which the flap does not extend; first dorsal composed of a single spine, situated over or slightly in advance of middle of eye, equal to length of snout and bearing no barbs posteriorly; dorsal and anal similar; caudal fin shorter than snout, its margin convex; pectoral fins short, 2.6 to 2.8 in head.

Color greenish, variable, usually with a white spot on caudal peduncle just behind last rays of dorsal; sides of head with wavy bluish streaks; sides of tail often with pale longitudinal bands.

This species was not seen at Panama, but is here included because it is known from localities both north and south of the Isthmus and it doubtless in time will be taken on the coast of Panama. It is here described from specimens from the West Indies and Brazil, ranging from 90 to 170 mm. in length. This fish is said to reach a weight of 6 pounds.

Known from the coast of Florida, West Indies and Brazil.

208. Genus **Alutera** Oken.

Alutera Oken, Isis, 1917, 1183 (type *Balistes monoceros* Linnæus).

Ceratacanthus Gill, Proc. Ac. Nat. Sci. Phila., 1861, Suppl., 57 (type *Balistes aurantiacus* Mitchill).

Osbeckia Jordan & Evermann, Rept. U. S. Fish Comm., XXI, 1895 (1896), 424 (type *Balistes scriptus* Osbeck).

Body more or less elongate, strongly compressed; mouth small, oblique, lower jaw projecting; gill-slit oblique, longer than eye; dorsal spine long, slender, without barbs; caudal fin quite long, more or less pointed; pelvic bone not surmounted by a spine. A single species was taken at Panama. We, however, include *A. scripta,* a widely distributed species, which will doubtless sooner or later be taken on one or both coasts of Panama.

KEY TO THE SPECIES.

a. Body rather deep; dorsal fin with 35 to 38 rays; anal rays 39 or 40; sides of head with or without small black spots, no bluish wavy streaks. *schœpfii*, p. 802.

aa. Body not very deep; dorsal fin with 45 to 47 rays; anal rays 48 to 50; sides of head with prominent black spots and with bluish wavy streaks. *scripta*, p. 803.

579. Alutera schœpfii (Walbaum).

Balistes schœpfii Walbaum, Artedi Piscium, 1792, 461 (Long Island).

Balistes aurantiacus Mitchill, Trans. Lit. & Phil. Soc. N. Y., I, 1815, 468 (New York; adult).

Alutera punctata Agassiz, in Spix, Pisc. Brasil., 1829, 137, Pl. LXXVI (Brazil); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1718; Starks, Leland Stanford Jr. Univ. Pub., Univ. Ser., 1913, 63 (off coast of Brazil); Fowler, Proc. Ac. Nat. Sci. Phila., 1917, 135 (Colon).

Aluteres cuspicauda De Kay, Fauna N. Y., Fishes, 1842, 338 (New York; young).

Aluterus holbroocki Hollard, Ann. Sci. Nat., 4th Ser., IV, 1855, 7 (North America).

Aluterus cultrifrons Hollard, Ann. Sci. Nat., 4th Ser., IV, 1855, 8, Pl. IV, fig. 2 (New York and Bahia).

Ceratacanthus aurantiacus Gill, Proc. Ac. Nat. Sci. Phila., 1861, Suppl., 57.

Alutera schœpfii Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1718, P. CCLX, fig. 636.

Head to upper angle of gill-slit 3 to 3.4; depth 2.3 to 2.7; D. 35 to 38; A. 39 or 40.

Body elongate, strongly compressed; dorsal profile concave over snout, convex over eyes; head poorly differentiated; snout long, 1.1 to 1.18 in head; eye 4 to 5; mouth small; lower jaw projecting; gill-slit oblique, twice as long as eye in adult, not more than 1½ times the length of eye in small specimens; teeth broad, with triangular cutting edges, those in upper jaw in two series; body covered with rough spines, each of which with a separate base and expanded at the tip; first dorsal composed of a single spine, situated slightly behind middle of eye, usually not as long as head, posteriorly rough, but without distinct barbs; second dorsal and anal similar; caudal fin extremely long in young, proportionately shorter in adult, from ¼ to ½ the total length; pectoral fins short, 3.3 to 4 in head.

Color of specimens at hand dark brown; sides with dark round spots, these most numerous in our largest example and fewest in the smallest one; caudal fin very dark; other fin plain translucent.

There are only 4 specimens, ranging from 120 to 172 mm. in length, in the present collection. We have compared our specimens with others from North Carolina and Jamaica with which they essentially agree. The species apparently is not distinct from *A. punctata.*

Known from Massachusetts south to Brazil. Our specimens are from Fox Bay, Colon.

580. Alutera scripta (Osbeck).

Balistes scriptus Osbeck, Reise Ostind. China, Ed. II, 1765, p. 145.

Balistes monoceros var. *scriptus* Gmelin, Syst. Nat., I, Pt. III, 1789, 1463 (after Osbeck).

Balistes lævis Bloch, Naturg. Ausl. Fische, IX, 1795, 82, Pl. CCCCXIV (Morocco; Tranquebar).

Balistes ornatus Marion de Procé, Bull. Soc. Philo. Paris, 1822, 131.

Monacanthum proboscideum Ranzani, Novi Comment. Ac. Sci. Inst. Bonon., V, 1842, 8 (Brazil).

Aluterus venosus Hollard, Ann. Sci. Nat., 4th Ser., 1855, 14, Pl. IV, fig. 3 (New Ireland, Bismarck Archipelago).

Alutera picturata Poey, Proc. Ac. Nat. Sci. Phila., 1863, 178 (Cuba).

Monacanthus scriptus Günther, Cat. Fish. Brit. Mus., VIII, 1870, 252.

Alutera scripta Jordan & Evermann, Rept. U. S. Fish Comm., XXI, 1895 (1896), 424; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1719, Pl. CCLX, fig. 637 (figure wrong, probably young of *A. schœpfii*); Breder, Zoologica, IV, Pt. 4, 1925, 157 (Caledonia Bay).

Osbeckia scripta Jordan & Evermann, Bull. U. S. Fish. Comm., XXIII, 1903 (1905), 422, fig. 184 (after Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1900, Pl. CCLX, fig. 637, which is not *scripta*).

Head to upper angle of gill opening 3.15 to 4.6; depth 2.65 to 4; D. 47 to 49; A. 48 to 51; eye 3.25 to 5 in head; snout 1.1 to 1.3; pectoral 3.2 to 3.4.

This species differs from *A. schœpfii* in the more elongate body, smoother skin, longer dorsal and anal fins, shorter caudal fin and in color. Comparing young of about 100 mm. in length, the most striking difference is the length of the caudal fin. In *A. schœpfii* the caudal fin is long and narrow, being more than one-half the length of body, while in the present species it is broad and very notably less than half the length of body.

The color in the present species is variegated, the sides of head and body bearing prominent markings. In our small specimens from the west coast of Panama the entire head and sides are reticulated and marbled, the ground color being very dark, in spirits, and the reticulations pale. Dark bars extend across the pale chest and abdomen and to the base of the dorsal and anal fins, which are colorless; caudal fin dark, with a pale margin and black cross-bars. Large specimens from the West Indies have prominent dark spots on sides, and in front and below the eye there are bluish, wavy longitudinal stripes.

There are 3 specimens, ranging from 70 to 105 mm. in length, in the Panama collection, taken on the Pacific coast at Chame Point by Mr. Robert Tweedlie. It was not seen on the Atlantic coast of Panama.

The species is recorded from South Carolina, southward to the West Indies and Brazil, from Ascension Island and also from the East Indies, Hawaiian Islands and on the Pacific coast of America from Mazatlan, Clarion, Sacorro, and the Revillagigedo Islands. It recently has been recorded by Breder from Caledonia Bay on the east coast of the Isthmus.

Family LXVIII. Ostraciidæ.

The Trunk-fishes.

Body short, cuboid, 3, 4 or 5 angled, covered by a hard box-like shell, composed of more or less definitely defined polygonial plates, wanting only on caudal peduncle, about the mouth and bases of the fins; caudal peduncle long; mouth small, terminal; a single row of pointed teeth in each jaw; gill-opening a short, nearly vertical slit below and posterior to eye; dorsal fin small, inserted far backward, composed of soft rays only; caudal fin with 10 rays, its posterior margin square or rounded; anal fin similar to the dorsal and nearly opposite it; ventral fins wanting; pectoral fins short.

209. Genus **Lactophrys** Swainson.

Lactophrys Swainson, Nat. Hist. & Class. Fish., II, 1839, 324 (type *Ostracion trigonus* Linnæus).

Rhinesomus Swainson, Nat. Hist. & Class. Fish., II, 1839, 324 (type *Ostracion triqueter* Bloch).

Acanthostracion Bleeker, Nederl. Tijdsch. Dierk., III, 1866, 15 (type *Ostracion quadricornis* Linnæus).

Chapinus Jordan & Evermann, Rept. U. S. Fish Comm., XXI, 1895 (1896), 424 (type *Ostracion bicaudalis* Linnæus).

This genus consists of trunk-fishes which have the carapace 3-angled, the ventral surface being flat or concave. The carapace is closed behind the anal fin and it may or may not have frontal or lateral ventral spines. The dorsal fin consist of 9 or 10 rays and the caudal fin always has 10 rays. Four American species are known from the Atlantic coast, all of which are included in the following pages. The genus has not yet been found on the Pacific coast of America.

KEY TO THE SPECIES.

a. Carapace without spines anywhere. *triqueter,* p. 805.
aa. Carapace with spines, at least on the ventral ridges.
b. Frontal spines wanting; a single spine on each side of the ventral ridge.
c. Carapace closed behind the dorsal fin; body everywhere with round dark spots. *bicaudalis,* p. 806.
cc. Carapace open behind the dorsal fin; body mottled with pale areas and with a dark area behind gill-opening and another one on the side. *trigonus,* p. 806.
bb. A strong spine in front of each eye; a spine on each side on ventral ridge. *tricornis,* p. 807.

581. **Lactophrys triqueter** (Linnæus).

Ostracion triqueter Linnæus, Syst. Nat., Ed. X, 1758, 330 (India).

Ostracion concatenatus Bloch, Naturg. Ausl. Fische, I, 1785, 101, Pl. CXXXI (Martinique; on a drawing by Plumier).

Lactophrys triqueter Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1722, Pl. CCLXI, fig. 638.

Head 2.8; depth at nape 1.7; D. 10; A. 10.

Body short and deep, sharply 3-angled; no spines anywhere; dorsal ridge sharply compressed, beginning between posterior part of eyes and extending to dorsal fin; the carapace closed behind dorsal fin; head short; the anterior profile concave; snout projecting, 1.35 in head; eye 2.4; interorbital deeply concave, 1.45; mouth small, terminal; teeth in the jaws rather strong, pointed; dorsal fin highest anteriorly; caudal fin rather long, rounded; anal fin similar to the dorsal, its origin under about middle of dorsal; pectoral fins broad, the upper rays longest, 1.55 in head.

Color in life dark green above; ventral surfaces nearly black; sides with small greenish blue spots; bases of dorsal, caudal and pectorals black; the distal part of caudal fin black; the fins otherwise plain.

A single small specimen, 58 mm. long, upon which the above description is based, was taken. The adults are proportionately longer and more slender, the head is longer, and the angles of the body are less prominent. The species is not common on the Atlantic coast of Panama.

Known from North Carolina southward to Bahia, Brazil, occasionally straying northward as far as Woods Hole, Mass. Our specimen was taken at Porto Bello.

582. Lactophrys bicaudalis (Linnæus).

Ostracion bicaudalis Linnæus, Syst. Nat., Ed. X, 1758, 330 (India); Günther, Cat. Fish. Brit. Mus., VIII, 1870, 257.

Lactophrys trigonus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1723 (in part).

Lactophrys bicaudalis Breder, Zoologica, IV, Pt. 4, 1925, 157 (Caledonia Bay).

This fish was not seen by us, but it is readily separated from *L. trigonus*, its nearest relative, by the closed carapace behind the dorsal fin and by the many small dark spots on the body and caudal.

Known from the West Indies south to Ascension Island; recently recorded by Breder from Caledonia Bay on the Atlantic coast of Panama.

583. Lactophrys trigonus (Linnæus).

Ostracion trigonus Linnæus, Syst. Nat., Ed. X, 1758, 330 (India; after Artedi).

Ostracion yalei Storer, Bost. Journ. Nat. Hist., I, 1837, 353, Pl. VIII (Holmes Hole, Martha's Vineyard).

Ostracion oviceps Kaup, Archiv. Naturg., XXI, 1855, 218.

Ostracion trigonum Poey, Memorias, II, 1861, 362.

Ostracion undulatus Poey, Syn. Pisc. Cub., 1868, 441 (Havana).

Ostracion expansum Cope, Trans. Amer. Philo. Soc. Phila., 1871, 474, figs. 9 & 10 (St. Martins, West Indies).

Lactophrys trigonus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1723, Pl. CCLXIII, figs. 641 & 641a; Fowler, Proc. Ac. Nat. Sci. Phila., 1917, 136 (Colon).

Head 3.8; depth at nape 2.65 to 2.8; D. 10; A. 10.

Body sharply 3-angled; no spine before eye; each ventral ridge with a large flat spine situated somewhat in advance of vent; dorsal ridge sharply compressed, more or less notched in adult; the carapace open behind dorsal, followed by one or two separate scutes; head very deep; the snout not much in advance of forehead, 1.15 to 1.25 in head; eye 2.3; interorbital concave, 1.65; mouth small, terminal; teeth in the jaws strong, canine-like; dorsal fin small, with convex margin; caudal fin truncate; anal fin similar to the dorsal, its origin at vertical from base of last dorsal ray; pectoral fins broad, the upper rays longest, 1.5 to 1.6 in head.

Color in alcohol greenish gray, the center of the plates somewhat lighter; black lines back of the gill-opening, forming more or less distinct circles, similar markings further back on side at level of eye and above and somewhat in advance of spines on ventral ridges; fins plain translucent.

We have 3 adult specimens at hand, ranging in length from 160 to 190 mm., upon which the above description is based. We also have a young individual, 53 mm. long, which differs so essentially from the adult that it seems advisable to call attention to these differences which do not appear to have been described previously. The head in the young is proportionately much larger (2.7 in body); the body is notably shorter and deeper (the depth at nape 1.7 in length); the dorsal ridge is notably higher; and the ventral spines are much smaller, being mere points, scarcely as long as pupil. The species is used as food to a limited extent.

Known from Massachusetts to Bahia, Brazil. Our specimens are from Colon.

584. **Lactophrys tricornis** (Linnæus).

Ostracion tricornis Linnæus, Syst. Nat., Ed. X, 1758, 331 (no locality given).

Ostracion quadricornis Linnæus, Syst. Nat., Ed. X, 1758, 331 (no locality given).

Ostracion lister Lacépède, Hist. Nat. Poiss., I, 1798, 468, Pl. XXIII, fig. 2 (no locality given).

Ostracion sexcornutus Mitchill, Amer. Monthly Mag., II, 1818, 328 (mouth of Mississippi River).

Ostracion maculatus Hollard, Ann. Sci. Nat., 4th Ser., VII, 1857, 149.

Ostracion guineensis Bleeker, Nederl. Tijdsch. Dierk., II, 1865, 302 (Guinea).

Ostracion gronovii Bleeker, Nederl. Tijdsch. Dierk., II, 1865, 302.

Acanthostracion polygonius Poey, Enumeratio, 1876, 175 (Cuba).

Ostracium quadricorne Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1882 (1883), 854.

Lactophrys tricornis Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1724, Pl. CCLXI, fig. 639; Fowler, Proc. Ac. Nat. Sci. Phila., 1917, 136 (Colon).

Head 2.95 to 3.1; depth at nape 1.75 to 2; D. 9 or 10; A. 10.

Body sharply 3-angled; a prominent, horn-like spine before each eye; each ventral ridge with a prominent spine, situated somewhat in advance of anal; dorsal ridge sharply compressed; the carapace closed behind the dorsal fin; head deep; snout little in advance of forehead, 1.15 to 2 in head; eye 2.1 to 2.4; interorbital deeply concave, 1.05 to 1.15; mouth very small, terminal; teeth in the jaws rather strong, pointed; dorsal fin small, the anterior rays longest; caudal fin quite long, rounded; anal fin similar to the dorsal, its origin notably behind base of last dorsal ray; pectoral fins rather broad, the upper rays the longest, 1.25 to 1.45 in head.

Color in alcohol brownish, the abdomen paler; body everywhere spotted with black; the fins plain translucent.

This species is represented by 3 small specimens ranging in length from 35 to 45 mm. It does not appear to be common on the Atlantic coast of the Isthmus of Panama.

Known from Massachusetts southward to Natal, Brazil, also ranging eastward to the Cape of Good Hope. Our specimens are from Colon.

Family LXIX. **Tetraodontidæ.**

THE PUFFERS.

Body oblong or elongate; the belly usually capable of great inflation either with air or water; head large; mouth small, terminal; teeth in each jaw fused into a kind of beak with a median suture; gill-slits small, situated immediately in front of pectorals; scales usually absent; the skin often covered with prickles; lateral line conspicuous or not; air-bladder present; spinous dorsal and ventral fins absent; dorsal fin inserted posteriorly, short, consisting of soft rays only; caudal fin various in shape; anal fin similar to the dorsal and opposite or slightly behind it; pectoral fins short and broad. The members of this family are for the most part restricted to the warmer coastal waters. They are sluggish swimmers and when inflated they float on the back at the surface. Inflation usually takes place when the animal is disturbed and it is doubtlessly a means of protection, for the body is thereby greatly enlarged and the prickles on the skin, when the abdomen is inflated, project much more strongly. Five genera are represented in the Panama collection.

KEY TO THE GENERA.

a. Nostrils with 2 distinct openings on each side, usually with a more or less distinct tube.

b. Olfactory organ consisting of a single short canal on each side, with 2 small openings; the canal without cup-shaped pits, the inner surface usually being smooth or provided with one or a few folds of skin.

c. Body comparatively elongate; dorsal and anal fins rather long, each with 12 to 15 rays; lower sides of tail with a cutaneous fold. *Lagocephalus,* p. 809.

cc. Body oblong, plump; dorsal and anal fins small, consisting of 6 to 8 rays each; lower sides of tail without a distinct cutaneous fold. *Sphœroides,* p. 811.

bb. Olfactory organ consisting of a transverse tube, open at each end to its full diameter; the inner surface of the tube closely covered with cup-shaped pits visible to the naked eye. *Guentheridia,* p. 821.

aa. Nostrils with a single opening on each side, without a tube, and with or without a bifid tentacle.

d. Each nostril with a bifid tentacle; the body rather broad, the back not compressed. *Tetraodon,* p. 822.

dd. Nostrils without a distinct tube or tentacle, with a single small opening on each side; the back compressed and produced into a short prominence over the pectoral fins. *Canthigaster,* p. 825.

210. Genus **Lagocephalus** Swainson.

Lagocephalus Swainson, Nat. Hist. & Class. Fish., II, 1839, 328 (type *Tetraodon stellatus* Donovan).

Physogaster Müller, Abh. k. Ak. Wiss. Berlin, 1839, 252 (type *Tetraodon lunaris* Bloch & Schneider; name preoccupied).

Gastrophysus Müller, Achiv. Naturg., IX, 1843, 330 (type *Tetraodon lunaris* Linnæus; substitute for *Physogaster,* preoccupied).

Body comparatively elongated; skin smooth or variously prickly, prickles most strongly developed on abdomen; nostrils without distinct papillæ, each with two distinct openings; lower sides of tail with a cutaneous fold; dorsal and anal fins long, falcate, each with 12 to 15 rays; caudal fin deeply lunate.

KEY TO THE SPECIES.

a. Body rather robust, the depth 3.1 to 3.3 in length; head 2.6 to 2.7. *pachycephalus*, p. 810.

aa. Body rather elongate, the depth 4.3 to 4.5 in length; head 3.25 to 3.3. *lævigatus*, p. 811.

585. Lagocephalus pachycephalus (Ranzani).

Tetrodon pachycephalus Ranzani, Novi Comment. Ac. Sci. Inst. Bonon., IV, 1840, 73, Pl. XI, fig. 2 (Brazil).

Lagocephalus pachycephalus Jordan & Rutter, Proc. Ac. Nat. Sci. Phila., 1897, 128; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1728; Fowler, Proc. Ac. Nat. Sci. Phila., 1917, 136 (Colon).

Head 2.6 to 2.7; depth 3.1 to 3.3; D. 13 or 14; A. 13.

Body rather robust; head large; snout blunt, 5.15 to 5.25 in head; eye 3.3 to 3.4; interorbital (bone) 3.2 to 3.7; mouth small, terminal, the lips with dermal folds; the skin smooth above and on sides, the chest and abdomen with rather strong prickles, a slight fold of skin along lower part of side of tail; lines of mucous pores distinct, four short lines inclosing a quadrangular area back of eye, a line surrounding the eye extending from the anterior corners, the lateral line extending from the posterior angle directly backward nearly to origin of dorsal, then downward to middle of side of caudal peduncle; dorsal fin rather long, highest anteriorly, its origin somewhat nearer anterior margin of eye than tip of caudal; caudal fin rather long, its posterior margin rather deeply lunate, the upper lobe longest; anal fin similar to the dorsal and opposite it; pectoral fins short and broad, the upper rays longest, 2.05 to 2.25 in head.

Color in alcohol light grayish above; sides bright silvery; lower surface plain white; interorbital area somewhat darker than the ground color; dark bar crossing the back about midway between the eyes and the origin of the dorsal; a second dark bar under the base of the dorsal and a third one on the caudal peduncle; the anal fin plain translucent; all the other fins more or less dusky.

This species is probably quite rare on the coast of Panama. Only 2 small specimens, each 113 mm. in length, were seen.

Known from the West Indies to Brazil. Our specimens are from Mindi Cut, Canal Zone.

586. Lagocephalus lævigatus (Linnæus).

Tetraodon lævigatus Linnæus, Syst. Nat., Ed. XII, 1766, 411 (Charleston, S. C.).

Tetrodon curvus Mitchill, Trans. Lit. and Phil. Soc. N. Y., I, 1815, 472 (New York).

Tetrodon mathematicus Mitchill, Trans. Lit. and Phil. Soc. N. Y., I, 1815, 474 (New York).

Holocanthus melanothos Gronow, Cat. Fish, 1854, 24 (Carolina).

Tetrodon lineolatus Poey, Syn. Pisc. Cub., 1868, 432 (Cuba).

Lagocephalus lævigatus Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1882 (1883), 860; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1728, Pl. CCLXIII, fig. 642.

Head 3.25 to 3.3; depth 4.3 to 4.5; D. 13 or 14; A. 12 or 13.

Body rather elongate, slender; head large; snout blunt, 2.1 in head; eye 4.8; interorbital 2.3; skin of back and sides smooth; chest and abdomen with depressible spines; lower edge of caudal peduncle with a fold of skin; mucous lines as in *L. pachycephalus;* dorsal and anal fins large and falcate, the last rays rapidly shortened; caudal fin deeply lunate.

Color in alcohol purple above to nearly black; sides dirty silvery; belly white. The young have 3 broad, dark, transverse bands on back of trunk, 1 on caudal peduncle and similar narrower bands on top of head.

This species comes within the scope of the present work, but it was not seen by us. The above description is compiled from published accounts. This fish is said to be sluggish and to reach a length of 2 feet. It appears to be of no value for food.

Known from Massachusetts to Brazil; not as yet recorded from Panama.

211. Genus **Sphœroides** Duméril.

Les spheroides Lacépède, Hist. Nat. Poiss., II, 1800, 22 (type French name only, *"Le sphéroide tuberculé"*).

Spheroides Duméril, Zoöl. Analy., 1806, 108 and 342 (type *"Le sphéroide tuberculé"* Lacépède).

Cirrhisomus Swainson, Nat. Hist. & Class. Fish., II, 1839, 328 (type *Tetrodon spengleri* Bloch).

Orbidus Rafinesque, Analyse Nat., etc., 1815, 90 (substitute for *"Les sphéroides* Lacépède).

Chelichthys Müller, Abhand. k. Ak. Wiss. Berlin, 1839, 252 (type *Tetraodon testudineus* Linnæus).

Holocanthus Gronow, Cat. Fish, 1854, 23 (type *Holocanthus leionothos* Gronow; name preoccupied).

Anchisomus Kaup, in Richardson, in Forbes, Zoöl. Voy. Herald, 1854, 156(*type Tetrodon spengleri* Bloch).

Body oblong, plump, capable of considerable inflation; a single short nasal canal on each side with two openings near its tip; skin often largely smooth, sometimes with more or less distinct scale-like dermal development, usually also with prickles at least on a portion of the back and abdomen, and not infrequently with dermal cirri; dorsal and anal fins similar, small, consisting of 6 to 8 rays each; caudal fin moderate, usually with straight or convex margin, but occasionally slightly concave. This genus consists of many species, mostly American, which inhabit warm seas.

KEY TO THE SPECIES.

a. Caudal fin slightly rounded posteriorly or nearly straight, never concave.

b. Body with evident membranous (not ossified) scales on sides, having free margins and being arranged in more or less definite series like normal scales. *marmoratus*, p. 813.

bb. Body without well developed membranous scales, small, if present, and without free margins.

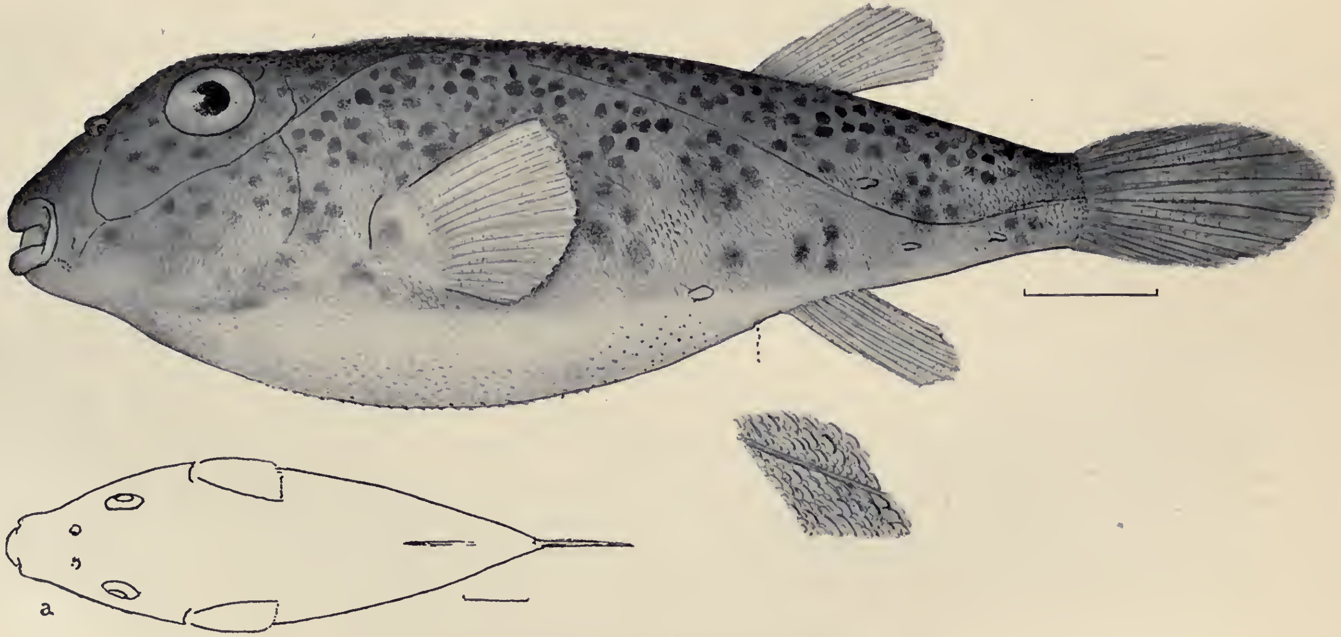
c. Sides with a row of round black spots bounding the dark area of the back and the white of the abdomen; no pale lines or reticulations on back and sides; snout long, 1.8 to 2.1 in head.

d. Skin of body mostly prickly, spines present from eyes to origin of dorsal, also on snout and abdomen; body robust, the depth at nape 3 to 3.5 in length; origin of anal a little behind vertical from base of last ray of dorsal; pectoral fins rather long, 2 to 2.4 in head. *lobatus*, p. 814.

dd. Skin of body largely smooth, a prickly area on back extending from nape about half way to dorsal; abdomen with prickles; no prickles on snout; body rather slender, the depth 3.6 to 5.1 in length; origin of anal under middle of base of dorsal; pectoral fins short, 2.75 to 3 in head. *spengleri*, p. 815.

cc. Sides without a definite row of black spots bounding the line of the abdomen; snout convex, of moderate length, about 2 to 2.5 in head (except in *S. angusticeps* in which it is long and concave, 1.5 in head).

e. Back usually with pale or yellowish lines or reticulations; body robust; width of head just anterior to gill-openings 1.15 to 1.25 in its length; profile of snout convex; back and abdomen prickly;



SPHOEROIDES MARMORATUS (Ranzani).
Drawn from a specimen 100 mm. in length.

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f. Interorbital bone usually convex, very broad, about 4 in head in specimens 100 mm. long, 3.2 in specimens 150 mm. long; color of back dark brownish, with more or less definite light yellow lines, inclosing circular and elliptical areas, the ellipses occupying a longitudinal position on the back, a small ellipse inclosed in a larger one (the light yellow lines wanting in large specimens); no evident reticulations on sides; black spots on sides, if present, very small. *annulatus,* p. 816.

ff. Interorbital bone more or less concave, narrow, about 6.5 in head in specimens 100 mm. long, 4.6 in specimens 150 mm. long; color of back very dark brown, with light lines inclosing circular and elliptical areas and forming reticulations on sides, the ellipses occupying a transverse position on back; black spots on sides large and distinct. *testudineus,* p. 817.

ee. Back without lines or reticulations; sides with few small spots or none; body elongate, rather slender; width of head just anterior to gill-opening 1.35 to 1.4 in its length; back and abdomen smooth, with or without pores.

g. Snout moderate, its profile convex, 2.05 to 2.2 in head; interorbital bone of moderate width, convex, 3.85 to 4.15 in head in specimens 180 to 190 mm. long; skin without dermal tentacles. *kendalli* sp. nov., p. 819.

gg. Snout very long, its profile convex, 1.5 in head; interorbital concave, 8 in head in a specimen 255 mm. in length; a pair of dermal flaps, about an eye's diameter apart, situated on back at vertical from base of pectorals. *angusticeps,* p. 820.

aa. Caudal fin posteriorly moderately concave; snout short, 2.6 to 3.3 in head; color brownish above, the back with large dark blotches nearly as broad as the back; fins all colorless. *fürthii,* p. 821.

587. Sphœroides marmoratus (Ranzani). Plate LXXVII.)

Tetrodon marmoratus Ranzani, Novi Comment. Ac. Sci. Inst. Bonon., IV, 1840, 73, Pl. X, fig. 1 (Brazil).

Spheroides marmoratus Jordan & Rutter, Proc. Ac. Nat. Sci. Phila., 1897, 129; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1733.

Head 2.5 to 2.8; depth 3.1 to 3.8; D. 7 or 8; A. 6 or 7.

Body moderately robust; head rather large; snout moderate, 2 to 2.15 in head; eye 3.6 to 5.3; interorbital (bone) 5.1 to 8; skin with prickles from interorbital nearly to origin of dorsal, and on chest and abdomen; sides of head and body with distinct membranous scales, arranged in more or less definite series like normal scales but not ossified; the edge of abdomen with a few cirri; lateral line very distinct; dorsal fin rather high, inserted posteriorly, about equidistant from anterior margin of eye and tip of caudal; caudal fin moderate, its posterior margin slightly convex; anal fin similar to dorsal, but somewhat lower, its origin under or slightly behind middle of base of dorsal; pectoral fins rather short and broad, the upper rays longest, 2.1 to 2.3 in head.

Color in alcohol dark grayish brown above, with many dark spots varying in size among specimens, largest on sides of back; some specimens with pale reticulations on sides and occasionally on back; lower parts pale; caudal fin dusky, but without an indication of bars; other fins colorless.

There are 8 specimens of this rather rare species in the Panama collection, ranging in length from 50 to 95 mm. We have had for comparison specimens from Porto Rico and San Domingo which had been identified by previous workers. Much variation in color, size of eye, and the size of the prickly areas is evident. The one character, however, that readily separates this species from all others examined by us, is the distinctness of the scale-like dermal development on sides of head and body. This character is not mentioned in current descriptions, but it certainly is worthy of consideration.

Known from the West Indies to Brazil. Our specimens are all from Fox Bay, Colon.

588. Sphœroides lobatus (Steindachner).

Canthogaster lobatus Steindachner, (Sitzb. k. Ak. Wiss. Wein, LXI) Ichth. Notizen, X, 1870, 18, Pl. V, fig. 3 (Altata).

Spheroides lobatus Jordan, Proc. Cal. Ac. Sci., 2nd Ser., V, 1895, 490; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1731; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 156; Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 165 (Taboguilla Island, Panama Bay).

Head 2.4; depth 3 to 3.5; D. 8; A. 6.

Body comparatively elongate; head rather narrow; snout long, 1.9 in head; eye 3.8 to 4.6; interorbital (bone) 5.1 to 7.6; the skin of the body mostly rough; spines present from eyes to dorsal, also spines on snout, and rather prominent ones on the abdomen; no dorsal cirri present; dorsal fin far back, its origin about equidistant from middle of eye and tip of caudal; caudal fin rather long, rounded; anal fin similar to the dorsal, its origin a little behind vertical from base of last ray of dorsal; pectoral fins rather broad, 2 to 2.4 in head.

Color in alcohol very dark gray above, pale below; the back with small round black spots; a row of larger black spots on sides of the pale abdomen; a dark cross-bar between eyes; caudal fin with a dark bar at base, the distal third black; other fins pale.

This rare species is represented by 2 small specimens, respectively 43 and 57 mm. in length. We compared our specimens with one 90 mm. in length from Mazatlan and find them identical.

Known from the Gulf of California to the Galapagos Islands. Our specimens are from Chame Point and Naos Island.

589. **Sphœroides spengleri** (Bloch).

Tetrodon spengleri Bloch, Naturg. Ausl. Fische, I, 1785, 135, Pl. CXLIV (East Indies).

Tetrodon plumieri Bloch & Schneider, Syst. Ichth., 1801, 509 (Martinique).

Tetrodon turgidus Poey, Syn. Pisc. Cub., 1868, 432 (Cuba).

Spheroides spengleri Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1732, Pl. CCLXIV, fig. 644.

Head 2.2 to 3.1; depth 3.6 to 5.15; D. 7 or 8; A. 6 or 7.

Body rather slender; head narrow, compressed; snout long, 1.85 to 2.2 in head; eye 4 to 5.5; interorbital (bone) 7 to 12, varying with age; skin of back from nape backward half way or more to dorsal with small prickles; chest and abdomen with smaller prickles; snout, sides and tail smooth; lateral line evident; dorsal fin not very high, its origin about equidistant from tip of tail and posterior margin of eye; caudal fin moderate, the margin convex; anal fin similar to the dorsal and of about the same height, its origin under middle of base of dorsal; pectoral fins rather short and broad, 2.75 to 3 in head.

Color of fresh specimen: Back dark green, with more or less blue on interorbital and nape; a row of poorly defined black spots from below eye to base of caudal; a row of large well defined black spots from mandible to base of caudal; lower parts pale; iris bright red; caudal fin with a dark bar at base and one on distal part of fin; fins otherwise colorless. The color is fairly uniform in all specimens at hand. In alcohol the back is grayish brown above and more or less irregularly speckled with dark points and spots.

This species is represented by a series of 34 specimens, ranging in length from 30 to 100 mm. It is not as rare on the Atlantic coast of Panama as *S. marmoratus* but much less common than *S. testudineus.*

Known from Massachusetts to the West Indies; also recorded from the French Congo. The range is now extended southward to the Atlantic coast of Panama. Our specimens are from Colon and Porto Bello.

590. Sphœroides annulatus (Jenyns). (Plate LXXVIII, fig. 1.)

Tetrodon annulatus Jenyns, in Darwin, Zoöl. Voy. Beagle, Pt. IV, Fish, 1842, 153 (Chatham Island, Galapagos Archipelago).

Anchisomus geometricus Kaup, in Richardson, in Forbes, Zoöl. Voy. Herald, 1854, 156, Pl. XXX (Galapagos Islands; not of Bloch & Schneider).

Tetraodon politus Girard, (House of Repr. Ex. Doc. No. 91) Rept. Expl. & Surv. Miss. R. to Pac. O., X, Pt. IV, 1858, 340 (San Diego, Cal.).

Tetrodon heraldi Günther, Cat. Fish. Brit. Mus., VIII, 1870, 283 (Galapagos Islands and Panama; after Richardson's specimen).

Tetrodon geometricus Günther, Trans. Zoöl. Soc. London, VI, 1869, 489.

Sphæroides testudineus var. *annulatus* Jordan & Edwards, Proc. U. S. Nat. Mus., 1886, 240.

Spheroides politus Jordan & Bollman, Proc. U. S. Nat. Mus., 1889 (1890), 183 (Panama Bay).

Spheroides annulatus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1735; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 157 (Panama); Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 165 (Perico Island, Panama Bay); Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 411 (Panama).

Head 2.5 to 3; depth 3.3 to 4; D. 8; A. 6 or 7.

Body robust, nearly round in cross section when not inflated; head rather flat above; snout moderately blunt, 2.2 to 2.5 in head; eye 3.5 to 6.3; interorbital broad, flat, increasing notably in width with age, the bone 2.9 to 5 in head; dorsal surface from interorbital to dorsal fin covered with small sharp spines, the spines also covering skin of sides behind base of pectorals and the entire belly; dorsal fin placed far back, its origin about equidistant from tip of caudal and posterior margin of eye; caudal fin very slightly rounded; anal fin similar to dorsal, but somewhat smaller, its origin under or just behind the base of the last ray of dorsal; pectoral fins rather broad, 1.7 to 2.45 in head.

Color above dark brownish, the ventral surface pale; the color markings of the back vary; usually a yellowish line across snout in advance of the nostrils; 2 yellow cross lines behind eyes, the anterior one extend-

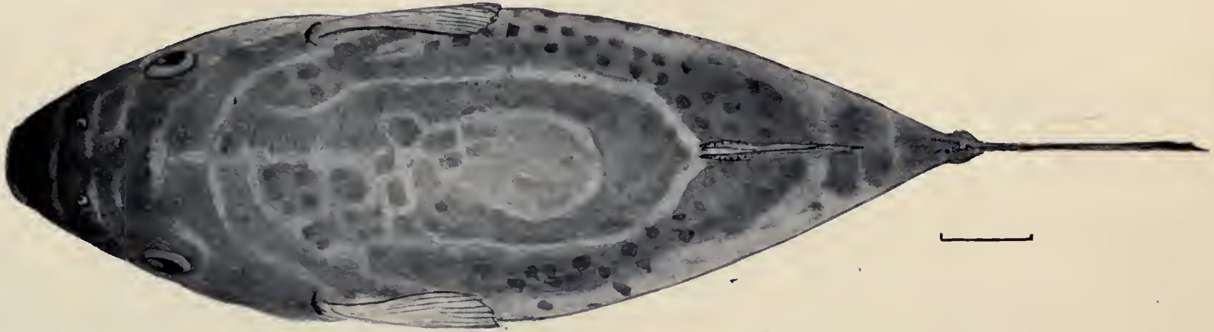

FIG. 1. **SPHOEROIDES ANNULATUS** (Jenyns).
Drawn from a specimen 135 mm. in length.

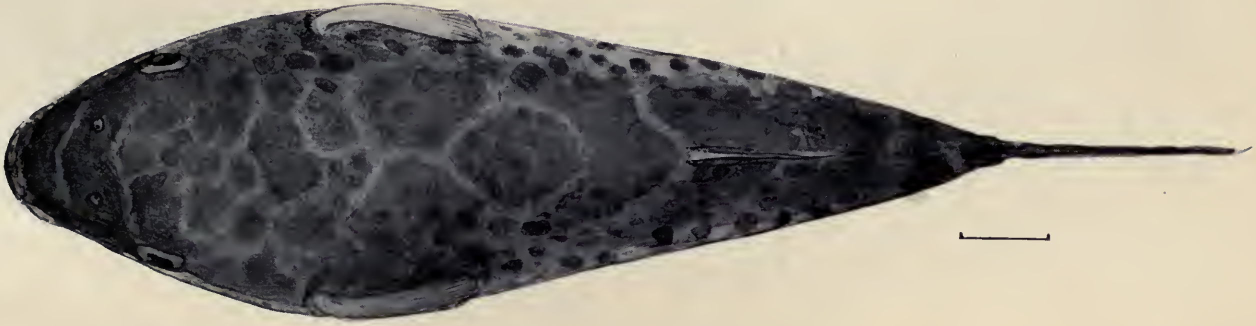

FIG. 2. **SPHOEROIDES TESTUDINEUS** (Linnæus).
Drawn from a specimen 140 mm. in length.

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ing downward and backward to gill-opening, the posterior one running parallel with the anterior one and extending on sides behind base of pectorals. In some specimens there is a short line on middle of head connecting the two. Then there is a yellow line enclosing an oblong area on back which extends from an eye's diameter back of the second cross stripe, described above, to origin of dorsal. Inside of the area thus enclosed is another yellow line which encloses a smaller oblong or elliptical area which, however, in an occasional specimen is almost perfectly round. Frequently a line on middle of back extends forward from the small ellipse, or circle, to the large ellipse. The back and sides usually with dark spots; these vary in size, number and intensity on different specimens and on an occasional specimen they are entirely wanting. The fins are yellowish in life; the caudal usually with a dark bar at base and the distal third black. The pale lines (yellowish in life) on back, while varying in intensity among specimens, are narrower and more distinct in the young than in the adult. Specimens about 240 mm. in length have broad and rather indistinct pale lines on the back and our largest specimen 305 mm. long has no trace of pale lines. The dark spots, however, become more numerous with age, specimens of 240 mm. and upward in length being profusely spotted on sides and back.

This puffer is extremely abundant on the Pacific coast of Panama, ascending tide streams to fresh water. We preserved 84 specimens ranging in length from 15 to 305 mm. Gilbert & Starks (1904) report that the species frequently appeared in the Panama City market. We, however, did not see it in the market and did not learn that it was of any economic value.

Known from California to Peru and also from the Galapagos Islands. Our specimens are from Chame Point, Taboga Island, Corozal and Balboa.

591. Sphœroides testudineus (Linnæus). (Plate LXXVIII, fig. 2.)

Tetraodon testudineus Linnæus, Syst. Nat., Ed. X, 1758, 332.

Tetrodon geometricus Bloch & Schneider, Syst. Ichth., 1801, 508 (Virginia).

Tetraodon ammocryptus Gosse, Naturalist's Sojourn in Jamaica, 1851, 287 (Jamaica).

Anchisomus reticularis Kaup, in Richardson, in Forbes, Zoöl. Voy. Herald, 1854, 161, Pl. XXXI (not *Tetrodon reticularis* Bloch & Schneider).

Holocanthus leionothos Gronow, Cat. Fish, 1854, 24 (American Ocean).

Tetrodon testudineus Günther, Cat. Fish. Brit. Mus., VIII, 1870, 282.

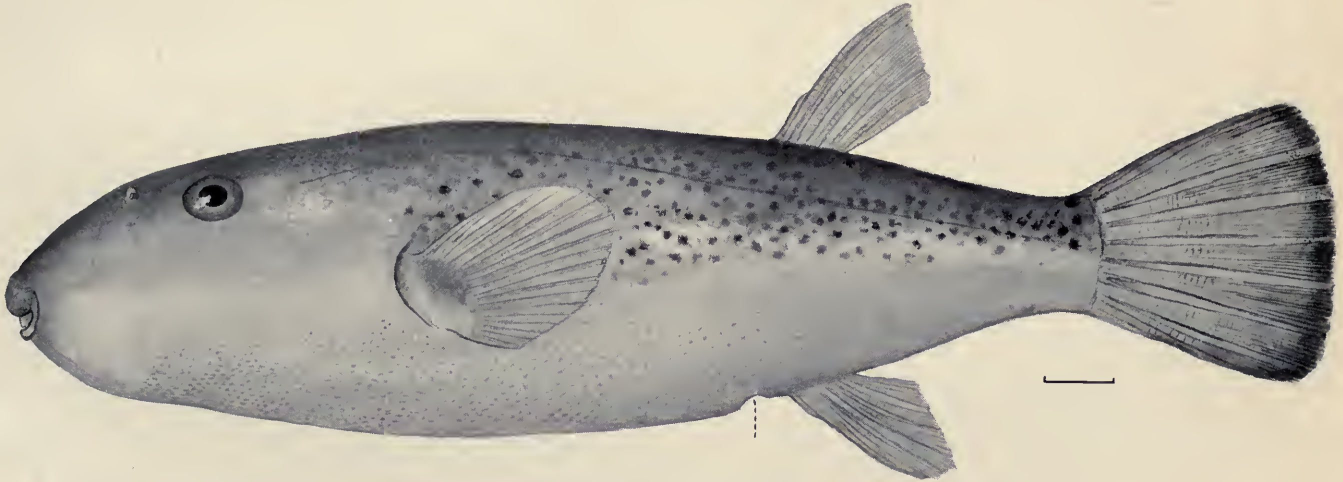
Spheroides testudineus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1734, Pl. CCLXV, figs. 646 and 646a; Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 405 and 1917, 136 (Colon); Breder, Zoologica, IV, Pt. 4, 1925, 142 and 157 (Gatun Spillway and Caledonia Bay).

Head 2.4 to 2.8; depth 3.3 to 4; D. 7 or 8; A. 6 or 7.

Body robust; head rather broad; snout moderate, 2 to 2.8 in head; eye 3.85 to 6.1; interorbital (bone) 4.6 to 8, getting proportionately broader with age, more or less concave, or at least with a slight ridge over orbit; the skin with small prickles on back from interorbital nearly to dorsal, and extending down on sides under and behind tip of pectorals; chest and abdomen also prickly; snout and tail smooth; no cirri present; lateral line evident; dorsal fin inserted posteriorly, its origin about equidistant from anterior margin of eye and tip of tail; caudal fin rather long, slightly convex; anal fin similar to the dorsal, but smaller, its origin under base of posterior ray of dorsal; pectoral fins short and broad, 2 to 2.5 in head.

Color of a fresh specimen: Ground color of back nearly uniformly dark brown, breaking up on sides and becoming lighter; sides with black spots, increasing in number with age; the back with narrow light lines (rarely yellowish in life), forming reticulations on all specimens at hand; two pale lines between eyes, inclosing interorbital area; the posterior line with a median backward extension, meeting an ellipse on occiput; another line extending backward on median line of back from this ellipse to a circular area on middle of back; another irregular pale line crossing the back just in advance of dorsal and 2 behind the dorsal; these lines connecting with other reticulating lines on sides; belly pale; caudal fin sometimes wholly dusky but more usually with a dusky bar at base and the distal fourth of the fin dusky; other fins pale greenish, unmarked.

This species is extremely abundant on the Atlantic coast of Panama and, like its near relative *S. annulatus* from the Pacific, it ascends streams. We preserved 150 specimens, ranging in length from 40 to 215 mm. *S. testudineus* is rather closely related to *S. annulatus* but the interorbital is somewhat narrower, a difference which is evident only when specimens of like size are compared, as this character varies greatly with age in both species. The interorbital in all Atlantic specimens at hand is more or less concave, with at least a slightly elevated ridge over orbit which can readily be detected under the skin through touch. None of our Pacific specimens have a concave interorbital and usually the bone is slightly convex. The young of *S.*



SPHOEROIDES KENDALLI sp. nov.
Drawn from the type 190 mm. in length.

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annulatus, at least, may be readily distinguished by the fewer lines on back and sides and by the large ellipses, the smaller one inside of the other, the larger one, and usually the smaller one, being notably longer than broad. In *S. testudineus* the areas surrounded by pale lines are broader than long, i.e., the ellipses occupy a transverse position on the back. The species is of no economic value.

Known from Woods Hole, Mass., to Natal, Brazil. Generally common from the West Indies southward. Our specimens are from Mindi, Toro Point, Colon and Porto Bello.

592. Sphœroides kendalli sp. nov. (Plate LXXIX.)

Spheroides testudineus Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 156 (Panama Bay; not of Linnæus).

Type No. 80952, U. S. N. M.; length 190 mm.; Panama Bay, Balboa, Canal Zone.

Head 2.95 to 3.05; depth 3.75 to 5; D. 8; A. 7.

Body rather elongate; head compressed, notably deeper than broad, its width just in advance of gill-opening 1.35 to 1.4 in its length; snout moderate, its profile convex, 2.05 to 2.2 in head; eye 4.9 to 5.6; interorbital moderately broad, slightly convex, 3.85 to 4.15 in head; back and abdomen with pores in the skin but without prickles or cirri; dorsal inserted about equidistant from tip of caudal and anterior margin of eye; caudal fin slightly rounded; anal fin similar to dorsal, but somewhat smaller, inserted at vertical from base of last dorsal ray; pectoral fins short and broad, 1.9 in head.

Color of the type grayish above, white below; no traces of pale or yellowish lines on sides or back; small dark spots on sides from pectorals to caudal; the fins pale greenish; the distal part of the caudal fin dusky. Our other specimen agrees with the type in color pattern, but the back and upper parts of the sides are very much darker, being dark brown.

We have at hand 2 specimens, respectively 180 and 190 mm. long, which appear to represent a new species. Gilbert & Starks (1904) provisionally referred 4 specimens of their collection from Panama Bay to *S. testudineus* and it is believed that those specimens, too, belong to the species here described. The species differs from both *S. testudineus* and *S. annulatus* in having no pale or yellowish markings on the back and sides, no evident prickles on the skin, and in the less robust head and body. The width of the interorbital bone, as shown by a comparison of specimens of even size of all 3 species, is intermediate, i.e., it is broader than in *S. testudineus* and narrower than in *S. annulatus*.

Our specimens are from Chame Point and Balboa. The species is named for Dr. William C. Kendall, of the U. S. Bureau of Fisheries, in recognition of his many valuable contributions to our knowledge of American ichthyology.

593. Sphœroides angusticeps (Jenyns).

Tetrodon angusticeps Jenyns, in Darwin, Zoöl. Voy. Beagle, Pt. IV, Fish, 1842, 154, Pl. XXVIII (Galapagos Islands); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 631 (Panama).

Anchisomus angusticeps Richardson, in Forbes, Zoöl. Voy. Herald, 1854, 159.

Spheroides angusticeps Jordan & Bollman, Proc. U. S. Nat. Mus., 1889, 183 (Panama); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1731; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 156.

"Head 2½; depth 3½ (when not inflated). D. 8; A. 7. Body comparatively elongate, the snout very long, concave in profile, a little longer than rest of head; eye large, 2 to 3 in snout. A well-marked pair of small dermal flaps, black in color, 1 on each side of median line of back, behind the occiput, and just behind gill opening, the two close together; interorbital area very narrow, deeply concave, channel-like, not so broad as eye, the width of its bony part 6½ in snout, about 12 in head; supraorbital bone prominent. Sides with a few small whitish dermal cirri or flattish flaps, irregular in size and position, sometimes wanting; our adult examples (Galapagos Islands) entirely smooth, the skin everywhere rough velvety; nostrils tubular, with 2 lateral openings near the summit. Caudal gently rounded, the middle rays longest; a slight trace of fold on caudal peduncle; pectoral broad, rounded, the upper rays longest. Skin on back and sides tending to form oblique lengthwise wrinkles. Color of adult, dark smoky gray, nearly uniform, the belly scarcely pale; base of fins dusky; no trace of lateral blotches. Pacific coast, from La Paz to the Galapagos Islands; rather rare. Here described from 2 adult examples (9 and 10 inches long) from Chatham Island of the Galapagos. One of these has the eye larger, the snout shorter, and the interorbital space much deeper than the other, a difference perhaps sexual. Both are uniformly colored and without prickles." (Jordan & Evermann.)

This species has not been taken in Panama Bay by recent collectors. We have examined a specimen 255 mm. in length from the Galapagos Islands. The extremely long snout, with the notably concave upper profile, and the narrow and deeply concave interorbital readily separate this species from all others occurring on the coasts of Panama.

Known from Lower California to Panama Bay and from the Galapagos Islands.

594. Sphœroides fürthii (Steindachner).

Tetrodon fürthii Steindachner, (Sitzb. k. Ak. Wiss. Wien, LXXIV) Ichth. Beitr., V, 1876, 22 (Panama).

Tetrodon fürthi Jordan, Proc. U. S. Nat. Mus., 1885, 393 (Panama).

Spheroides fürthi Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1737; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 158.

Head 2.3 to 2.5; depth 2.5 to 2.95; D. 8; A. 6.

Body moderately robust; head short; snout blunt, 2.6 to 3.3; eye 2.7 to 3.3; interorbital (bone) 5.25 to 5.7; skin on dorsal surface from interorbital nearly to origin of dorsal prickly, the chest and abdomen also rough, the rest of the body smooth; dorsal fin far back, its origin about equidistant from anterior margin of eye and tip of upper lobe of caudal; caudal fin moderate, its posterior margin concave, the upper lobe slightly the longer; anal fin similar to the dorsal, its origin under base of last ray of the dorsal; pectoral fins broad, the upper rays longest, 2 to 2.1 in head.

Color in alcohol: Back rather brownish, with large dark blotches nearly as wide as the back; the sides light brown; the abdomen pale; the fins all colorless.

There are 3 specimens of this rare species at hand, respectively 33, 34 and 41 mm. in length, collected by Mr. Robert Tweedlie at Chame Point. This species is characterized by the short snout, narrow interorbital and the concave caudal fin.

Known from Panama to Guayaquil, Ecuador. Our specimens are from Chame Point.

212. Genus **Guentheridia** Gilbert & Starks.

Guentheridia Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 158 (type *Tetrodon formosus* Günther).

This genus differs from *Sphœroides* in the structure of the olfactory organ, which is a transversely placed tube, open at each end to its full diameter. The outer end is squarely, the inner obliquely, truncate, making the upper margin of the tube very narrow. The inner surface of the tube is closely covered with cup-shaped pits, visible to the naked eye.

595. Guentheridia formosa (Günther).

Tetrodon formosus Günther, Cat. Fish. Brit. Mus., VIII, 1870, 283 (South America).

Spheroides formosus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1736; Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 165 (Perico Island, Panama Bay).

Guentheridia formosa Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 159 (Panama).

Head 2.65 to 3; depth normally 3.1 to 4.2; D. 7 or 8; A. 6.

Body robust; head low and broad, notably broader than deep; snout rather short, 2.55 to 2.7 in head; eye 5.1 to 7.1; interorbital (bone) broad, convex, 2.5 to 3.6; skin on back and abdomen with prickles, these much more prominent on some specimens than on others; no cirri; dorsal fin inserted about an eye's diameter nearer tip of caudal than eye; caudal fin nearly straight posteriorly, the lower lobe rounded; anal fin similar to the dorsal, inserted just behind vertical from base of last ray of dorsal; pectoral fins broad, 2 to 2.3 in head.

Color very dark on back; lower parts pale or dusky; the yellowish markings on the back variable; the smaller specimens with cross-lines on head and concentric rings, inclosing smaller rings on back and more or less definite reticulations on sides. In some of our larger specimens these lines are broken up into spots, with only a slight indication of concentric arrangement. The pale yellow color predominates in the largest specimens on which the ground color as well the lines are broken up into spots. The caudal fin is mostly or entirely dusky; the other fins are plain greenish.

Fifteen specimens of this rather common species were preserved. No young were seen. Our specimens range in length from 158 to 265 mm. This species is most like *S. annulatus,* from which it, however, may be distinguished by the different nasal development, broader and lower head, shorter snout, and the broader and notably convex interorbital.

Known from "South America" and Panama. Two of our specimens are from Chame Point, the others from the rocky islands near Balboa and Panama City.

213. Genus **Tetraodon** Linnæus.

Tetraodon Linnæus, Syst. Nat., Ed. X, 1758, 332 (type *Tetraodon lineatus* Linnæus).

Ovoides Cuvier, Lec. d'Anat. Comp., I, 1800, Tabl. 4 (type *Ovoides fasciatus* Lacépède).

Body rather robust; nostril on each side with a tentacle, bifid to the base, its tips without opening, the branches of the large olfactory nerve ending in cup-like depressions along the inner edges of the 2 flattish lobes; skin usually more or less prickly; dorsal and anal fins rounded, each with 7 to 14 rays; dorsal more or less in advance of anal; caudal rounded. The genus is distinguished from *Sphœroides* by the bifid nasal tentacle. It is represented in Panama Bay by a single species which is of wide distribution.

596. Tetraodon hispidus Linnæus.

Tetraodon hispidus Linnæus, Syst. Nat., Ed. X, 1758, 333 (India); Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 159 (Panama Bay); Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 165 (Naos Island, Panama Bay).

Tetraodon perspicillaris Rüppell, Atlas Reise Nörd. Afrika, Fische, 1828, 63 (Red Sea).

Tetrodon implutus Jenyns, in Darwin, Zoöl. Voy. Beagle, Pt. IV, Fish, 1842, 152 (Keeling Island).

Tetrodon laterna Richardson, in Hinds, Voy. Sulphur, Ichth., 1845, 124, Pl. LXI, fig. 2.

Arothron erethizon Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 631 (Panama).

Ovoides erethizon Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1739.

Head 2.25 to 2.8; depth 2 to 2.85; D. 9 to 11; A. 9 or 10.

Body rather stout, compressed; head large; snout moderate, 2 to 2.6 in head; eye 3.1 to 3.75; interorbital (bone) concave, 2.35 to 3.45; mouth quite small, terminal; lips more or less thickened in adult, papillose or plicate; jaws beak-like, each with a median suture; gill-slit equal to or longer than longest diameter of eye; body with or without spines or prickles, their number and length variable, prominent when the belly is inflated, when retracted their position is indicated only by pores in the skin; very young (20 mm.) with numerous dermal tentacles, these apparently replaced by spines with age; dorsal and anal similar, the origin of the anal immediately behind base of dorsal; caudal fin slightly convex, equal to or longer than snout; pectoral fins short and broad, the posterior margin convex, the upper part of fin longest, 2.1 to 2.8 in head.

Color of our smallest specimen (20 mm.) black, no pale spots above, the belly with white spots. A larger specimen (50 mm.) is also black, but it has pale, lengthwise streaks, slightly broader than the black interspaces on the abdomen; caudal fin black, the other fins pale green. Large specimens (230 to 330 mm.) are dark brown above, some of them having the upper parts spotted with white from the tip of the snout to the end of the caudal fin, others have the white spots wanting on the head and still others have spots only on the posterior part of the body and not extending on the caudal fin. The lower parts are pale and in a few specimens without markings, others have indications of dusky streaks and still others have definite dark longitudinal bands. The dorsal and anal are greenish and in the profusely spotted specimens they usually bear a few white spots on the base; caudal fin of about the same color as the upper part of body, with or without white spots; pectorals greenish, the basal portion dusky or black, inserted in a large black area which usually is more or less definitely surrounded by 1 and rarely 2 white circles.

Sixteen specimens, ranging in length from 20 to 330 mm., were preserved. The species is not uncommon about the rocky islands near Balboa and Panama City. A large amount of variation relative to the abundance and size of the spines on the body appears to prevail. Gilbert and Starks (1904) state: "The long quill-like spines protrude only when the fish is inflated. When retracted, the position of the spines is indicated by the pores in the skin." This is true of specimens having spines, but we have 2 individuals that are inflated and yet perfectly smooth, without indications of spines, except in advance of vent. It is probable that the presence or absence of spines is correlated with sex, as indicated by a limited number of dissections, the spineless individuals being females. Much variation in color is also evident and these differences do not seem to be as closely correlated with age and size as stated in published accounts. Our largest specimen (330 mm.), for example, has rather definite indications of dark lengthwise streaks on lower part of sides and it has white spots only on the posterior part of the body. Another specimen (275 mm.) has definite longitudinal bands on the abdomen, and on back and sides it is rather profusely spotted. Still another specimen (270 mm.) has no lengthwise streaks below, and on the back and sides it is profusely spotted. Molluscs form, at least, a part of the food of this fish which, because of the strong jaws, it is well able to crush.

A widely distributed species, occurring in the Indian Ocean and the tropical Pacific. Our specimens were taken about the rocky islands near Balboa.

214. Genus **Canthigaster** Swainson.

Canthigaster Swainson, Nat. Hist. & Class. Fish., II, 1839, 194 (type *Tetrodon rostratus* Bloch).

Eumycterias Jenkins, Bull. U. S. Fish Comm., XIX, 1899 (1901), 399 (type *Eumycterias bitæniatus* Jenkins).

Body moderately elongate; the back compressed and produced into a short prominence about midway between the eyes and origin of dorsal; snout quite long and pointed; nostrils with a single opening on each side. A single species is known from Panama.

597. Canthigaster punctatissimus (Günther).

Tetrodon punctatissimus Günther, Cat. Fish. Brit. Mus., VIII, 1870, 302 (Panama).

Tetrodon oxyrhynchus Lockington, Proc. Ac. Nat. Sci. Phila., 1881, 116 (Gulf of California).

Psilonotus punctatissimus Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882 (1883), 370.

Canthigaster punctatissimus Jordan & Edwards, Proc. U. S. Nat. Mus., 1886, 246; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1741.

Eumycterias punctatissimus Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 160, Pl. XXIII, fig. 46; Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 166 (Taboguilla Island; Perico Island, Panama Bay; and Acapulco and Chatham islands).

Head 2.5 to 2.6; depth 2.3 to 2.8; D. 9 or 10; A. 9.

Body moderately elongate, the back elevated; profile a little concave over snout; head rather large; snout slender, 1.55 to 1.65 in head; eye 3.8 to 4.15; interorbital (bone) 3.5 to 3.8; mouth very small, terminal; the skin of snout, chin and interorbital more or less prickly, one specimen only with prickles on back to dorsal fin, skin otherwise smooth; dorsal fin situated posteriorly, its origin a little nearer anterior margin of eye than tip of tail, its margin round; caudal fin rather short, moderately convex; anal fin similar to dorsal, its origin slightly behind vertical from base of last ray of dorsal; pectoral fins short, with emarginate margin, the upper rays longest, 2.3 to 2.4 in head.

Color grayish brown above, somewhat paler below; sides with many round, green spots nearly as large as pupil; these spots becoming smaller on the back where they are bright blue; abdomen unspotted; fins all plain.

This fish, reported not rare by Gilbert & Starks (1904), is represented in the present collection by only 3 small specimens, respectively, 55, 60 and 64 mm. in length. It is a very pretty little fish and it is readily distinguished by the bright green and blue spots on the body. It lives among the rocky islands in Panama Bay.

Known from Acapulco, Chatham Island and Panama Bay. Our specimens are from Taboga Island and Balboa.

Family LXX. **Diodontidæ.**

THE PORCUPINE FISHES.

Body short, depressed above; belly moderately inflatable; mouth moderate, terminal; jaws with bony plate like the beak of a bird, these not divided in middle by suture; nostril on each side forming a short tentacle, usually with 2 openings; gill-opening moderate, placed immediately in front of pectoral; body everywhere with bony spines except on snout, chin and caudal peduncle; dorsal and anal fins placed posteriorly, similar and nearly opposite each other; ventral fins wanting; pectoral fins short and broad. The species of this family are sluggish fishes, living among weeds and sometimes among rocks and corals in the warm seas. They are capable of inflating themselves either with air or water and when inflated the spines are all directed outward. In such a condition even a small porcupine fish could not easily be devoured by a moderately large predacious fish.

KEY TO THE GENERA.

a. Dermal ossifications consisting of slender, stiff, pointed, movable spines. *Diodon,* p. 826.

aa. Dermal ossifications consisting of short, stiff, immovable spines. *Chilomycterus,* p. 831.

215. Genus **Diodon** Linnæus.

Diodon Linnæus, Syst. Nat., Ed. X, 1758, 334 (type *Diodon hystrix* Linnæus).

Paradiodon Bleeker, Nederl. Tijdsch. Dierk., II, 1865, 271 (type *Diodon hystrix* Linnæus).

Body robust, the belly moderately inflatable; head short, broad; both jaws entire; nasal tube simple, with 2 lateral openings; body everywhere with strong, stiff dermal spines; dorsal and anal similar, posteriorly inserted; caudal fin rounded; ventral fins wanting; pectoral fins broad, the posterior margin truncate, the upper lobe longest.

KEY TO THE SPECIES.

a. Spines of moderate length, the frontal spines equal to or shorter than the post-pectoral ones. *hystrix*, p. 827.
aa. Spines longer, the frontal spines longer than the post-pectoral ones. *holacanthus*, p. 829.

598. Diodon hystrix Linnæus.

Diodon hystrix Linnæus, Syst. Nat., Ed. X, 1758, 335 (India); Günther, Cat. Fish. Brit. Mus., VIII, 1870, 306; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1745, Pl. CCLXVI, fig. 648; Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 411 (Panama).
Diodon atinga Bloch, Naturg. Ausl. Fische, I, 1785, 67, Pl. CXXV (not of Linnæus).
Diodon brachiatus Bloch & Schneider, Syst. Ichth., 1801, 513 (Cuba; after Parra).
Diodon punctatus Cuvier, Mémoir. Mus. Hist. Nat. Paris, IV, 1818, 132 (no locality given).
Diodon echinus Rafinesque, in Bonaparte, (Cat. Met. Pesci Eur.) Atti Sci. Ital., 1845, 87 (Mediterranean Sea).

Head 2.2 to 2.4; depth 2.45 to 3; D. 13 or 14; A. 12 or 13.

Body robust, normally (when not inflated) rather broader than deep; head depressed, notably broader than deep; snout very short, not greatly in advance of forehead, 2.8 to 3.1 in head; orbit 2.85 to 3.45; interorbital very broad, gently concave, 1.4 to 1.5; mouth rather broad; lips thick, especially in adult, plicate; jaws entire, with notches and tubercles on margins; gill-slit not longer than eye; spines moderate, the free portion proportionately shorter in the adult than in the young, the embedded portion longer, usually exceeding in length the free part, the postpectoral spines greatly exceeding in length the frontal spines (Our largest specimen has spines on the caudal peduncle; one pair well beyond the base of the anal and 2 pairs and an odd one on upper surface of the peduncle, the latter reaching nearly to base of caudal. These spines are wanting in other specimens examined.); spines distinctly 3-rooted and movable; dorsal and anal fins similar, placed far back; the dorsal inserted a little in advance of the anal, the origin of the latter falling under the middle of the base of the former; these fins about equally elevated, the longest rays about equal to the longest rays of pectoral; caudal fin scarcely longer than pectorals, rounded; pectoral fins broad, slightly truncate posteriorly, the upper lobe the longest, 1.65 to 2.33 in head, rays 20 or 21.

Color of our largest specimen (362 mm.) in alcohol olivaceous above, pale below; back, sides, snout and fins everywhere with round black spots, these smallest on snout; a dusky bar across chin and extending backward on each side to below base of pectorals. A smaller specimen (170 mm.) has a broad black bar across interorbital and continued a short distance below eye, another broad bar across occiput; a large black blotch above and behind base of each pectoral; a still larger black blotch on middle of back, situated a little posterior to the blotches above and back of base of pectorals; another large black blotch in front of and around base of dorsal; an irregular black blotch on side behind tips of pectoral rays; a few small round black spots on snout and larger black spots behind the spines, both above and on belly; no spots on fins, the dorsal and caudal each with a dusky intramarginal band.

The above description is based on 2 specimens, 170 and 362 mm. in length, taken at Taboga Island. As indicated in the foregoing description, these specimens are neither identical in color, nor wholly alike in the length and position of the spines. From an examination of published accounts and specimens in the National Museum collection, it is apparent that these specimens represent the form or forms which recent ichthyologists, at least, have regarded as *hystrix*. We also have 21 specimens from the Atlantic coast of Panama, ranging in length from 80 to 140 mm., which do not appear to be identical with the Pacific specimens already described, but which we are unable to place with any other known form. The genus stands in need of thorough study and revision and, to add another name to the numerous ones which have already been applied to the various forms of the genus from all over the world, would merely add to the confusion. We, therefore, refer these specimens to the present species with the following characterization of the specimens:

Head 2.3 to 2.55; depth 2.5 to 2.95; D. 11 or 12; A. 11 or 12.

Body normally (when not inflated) broader than deep; head quite broad, depressed: snout short, little exserted, 3.25 to 3.9 in head; eye 2.5 to 2.9; interorbital broad, slightly concave, 1.9 to 2.4; mouth rather broad, terminal; lips thickened, plicate; jaws entire, the margins slightly notched; gill-slit a little shorter than eye; spines of moderate length, distinctly 3-rooted and movable; the frontal and postpectoral spines usually of equal length or the latter slightly longer; no spines on caudal peduncle; few dermal flaps variously distributed over back and sides of body; dorsal and anal similar, placed far back; the origin of the anal under about the middle of the base of dorsal; the dorsal fin slightly longer and higher, the longest rays about equal to the length of the longest rays of the pectoral; caudal fin distinctly rounded, slightly longer than the pectorals; pectoral fins broad, the posterior margin straight or slightly concave, the upper lobe longest, 1.8 to 1.95 in head, rays 19 to 22.

Color pale to dark olivaceous above, white or dusky below; a black bar on interorbital extending across eye to cheek, this bar often interrupted on median line; another black bar at occiput; a large black blotch above and behind base of each pectoral; a large black cross-blotch on middle of back posterior to the black blotches above and behind base of pectorals; another large black blotch in front and around base of dorsal; usually also with a black blotch behind tips of pectorals. The back and sides are covered with small round spots that are variously distributed and that do not always occur in the axil of the spines and not at all on the chest and abdomen. The spots vary in number and size among individuals, usually being most numerous on the lighter colored specimens; fins all pale green, unmarked.

It will be noticed from the foregoing descriptions that the Atlantic coast specimens have the frontal spines longer in comparison with the postpectoral spines, the dorsal fin appears to be composed of fewer rays, and there is a difference in color which, however, may not be of any specific value. We do not find that the proportionate length of the spines varies greatly with age or that the frontal spines become proportionately shorter with age when compared with the postpectoral ones. The free part of the spines, however, is shorter and the embedded portion longer in the adult.

Recorded from all warm seas. Our specimens from the Pacific are from Taboga Island and our Atlantic specimens are from Colon.

599. **Diodon holacanthus** Linnæus.

Diodon holocanthus Linnæus, Syst. Nat., Ed. X, 1758, 335 (India; based on *Ostracion oblongus holocanthus* Artedi; misprint for *holacanthus*); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1746; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 160 (Panama).

Erizo guanabana Parra, Desc. Piezas de Hist. Nat., 1787, 62, Pl. XXIX, fig. 3 (Havana).

Diodon liturosus Shaw, Gen. Zoöl., V, Part II, 1804, 436 (after *Diodon tacheté* Lacépède).

Diodon spinosissimus Cuvier, Mémoir. Mus. Hist. Nat. Paris, IV, 1818, 134 (no locality).

Diodon novemmaculatus Cuvier, Mémoir. Mus. Hist. Nat. Paris, IV, 1818, 136, Pl. VI (no locality).

Diodon sexmaculatus Cuvier, Mémoir. Mus. Hist. Nat. Paris, IV, 1818, 136, Pl. VII (no locality).

Diodon multimaculatus Cuvier, Mémoir. Mus. Hist. Nat. Paris, IV, 1818, 136 (no locality).

Diodon quadrimaculatus Cuvier, Mémoir. Mus. Hist. Nat. Paris, IV, 1818, 137, Pl. VI (Otaiti).

Diodon melanopsis Kaup, Archiv. Naturg., XXI, Pt. I, 1855, 228.

Paradiodon quadrimaculatus Bleeker, Nederl. Tijdsch. Dierk., II, 1865, 271.

Diodon maculatus var. *a*, Günther, Cat. Fish. Brit. Mus., VIII, 1870, 307 (St. Croix, Jamaica, Panama, South America, Sandwich Islands, China, Sooloo Sea, Indian Ocean; based on *Diodon tacheté* Lacépède).

Head 2 to 2.55; depth 2.2 to 2.9; D. 13 or 14; A. 11 or 12.

Body normally (when not inflated) notably broader than deep; head broad, depressed; snout little exserted, 2.55 to 4.05 in head; eye 2.45 to 4.05; interorbital broad, gently concave, 1.45 to 1.7; mouth rather broad; jaws entire, the margins more or less notched; lips rather thick, slightly plicate; gill-slit scarcely as long as eye; spines long, 3-rooted and movable; the frontal spines very long, much longer than the postpectoral ones; dorsal and anal fins similar, placed far back; the origin of the anal under middle of base of dorsal; these fins about equally elevated, the longest rays scarcely as long as the longest pectoral rays; caudal fin rounded, a little longer than the pectorals; pectoral fins broad, the posterior margins truncate, the upper lobe the longer, 1.6 to 2.05 in head, rays 21 to 23.

Color in alcohol pale to dark olivaceous above, white or dusky below; a black bar on interorbital, extending below eye on cheek, usually present; this bar rarely continuous, being more often broken on median line of head; a second black cross-bar at occiput; a large black blotch above and behind base of pectorals; another black cross-blotch farther posteriorly on back and a large black blotch in front and around base of dorsal; some specimens with the snout or the lower parts or both unspotted; more usually the body, except head and chest, covered with black spots, smallest on the snout, occurring most frequently in the axil of the spines on the lower parts; the spots largest behind pectoral fins, there on some individuals becoming confluent and forming an irregular blotch; the fins pale greenish, unspotted.

This species is represented by 59 specimens, ranging in length from 80 to 175 mm. This fish was not seen often, but on February 5, 1912, it was extremely abundant around Naos Island and numerous specimens were taken in every seine haul. The fish occurring in this "school" ranged in length from 80 to 135 mm., and, while they varied considerably in color, they were quite uniform in other respects. The spines are very long, the frontal spines greatly exceeding in length the postpectoral spines. The specimens taken at Naos Island appear to represent the extreme type of those forms which have been referred to *holacanthus.* We have another lot of specimens taken near Balboa, ranging in length from 80 to 175 mm., which have somewhat shorter spines, the frontal spines being only a little longer than the postpectoral ones. These specimens, with respect to the development of the spines, approach our Atlantic coast specimens which we have provisionally referred to *D. hystrix.* The Pacific specimens, however, all appear to be uniform in having one more ray in the dorsal fin and in having a somewhat broader interorbital than the Atlantic specimens.

Known from all warm seas. Our specimens are from Naos Island and Balboa.

216. Genus **Chilomycterus** Bibron.

Chilomycterus Bibron, in Brisout de Barneville, Revue Zoölogique, 1846, 140 (type *Diodon reticulatus* Linnæus).

Cyclichthys Kaup, Archiv. Naturg., XXI, 1855, 231 (type *Diodon orbicularis* Bloch).

Cyanichthys Kaup, Archiv. Naturg., XXI, 1855, 231 (type *Cyanichthys cœruleus* Kaup).

Body broad, depressed, more or less inflatable; nasal tube simple, with 2 lateral openings; dermal spines 3-rooted, immovable, and triangular; caudal peduncle short; teeth on jaws without median suture.

KEY TO THE SPECIES.

a. Supraorbital ridge little elevated; a prominent spine on middle of forehead; a large prominent black spot on nape; a large black spot at origin of dorsal, involving a part of the base of fin. *antennatus,* p. 832.

aa. Supraorbital ridge notably elevated; prominent spine on middle of forehead wanting; no blotch on nape; a large black spot behind pectoral, and one on each side of dorsal. *spinosus*, p. 832.

600. Chilomycterus antennatus (Cuvier).

Diodon antennatus Cuvier, Mém. Mus. Hist. Nat. Paris, IV, 1818, 131, Pl. VII.

Chilomycterus antennatus Kaup, Archiv. Naturg., XXI, 1855, 232; Günther, Cat. Fish. Brit. Mus., VIII, 1870, 311; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1750; Fowler, Proc. Ac. Nat. Sci. Phila., 1917, 136 (Colon).

Chilomycterus puncticulatus Poey, Anal. Soc. Españ. Hist. Nat., X, 1881, 346 (Porto Rico).

Head 2.05 to 2.5; depth 1.9 to 2.6; D. 10 to 12; A. 10 or 11.

Body oblong, depressed; head notably broader than deep; snout very short, not much in advance of the forehead, 3 to 4.5 in head; eye 2.9 to 3.65; interorbital (bone) 1.95 to 3.55 in head; mouth small, transverse; the spines of the back strong, fixed, those of the abdomen more or less retractile; 2 spines on supraorbital with a long dermal tentacle between them; a short stiff spine on middle of forehead; a row of tentacles along lower lateral margin of head and 2 on each side somewhat in advance of vent; dorsal and anal fins similar and opposite each other, each with strongly convex margin; caudal fin moderate, rounded; pectoral fins broad, slightly emarginate, the upper rays longest, 2 to 2.6 in head.

Color of fresh specimens: Back olive-green; abdomen deep red to brownish; a large black spot in middle of nape; a large elongate spot above base of pectoral; a large black spot before and along anterior part of base of dorsal; head and chest usually with many black dots; the black dots in some specimens much more numerous than in others, covering nearly the entire body; the fins all yellowish green.

This species is represented by 17 specimens, ranging in length from 40 to 155 mm.; all taken in a shallow, grassy bay near Colon. It is not abundant and was not seen elsewhere. A rather unique, pretty fish, which is of no value as food.

Known from the West Indies southward; previously recorded from Porto Rico, Jamaica, St. Croix, Trinidad and the Cape of Good Hope. Our specimens are from Fox Bay, Colon.

601. Chilomycterus spinosus (Linnæus).

Diodon spinosus Linnæus, Syst. Nat., Ed. X, 1758, 335 ("India").

Diodon geometricus Bloch & Schneider, Syst. Ichth., 1801, 513, Pl. XCVI (America).

Cyclichthys cornutus Kaup, Archiv. Naturg., XXI, 1855, 231 (Bahia).

Chilomycterus geometricus var. *y*, Günther, Cat. Fish. Brit. Mus., VIII, 1870, 311 (type of *Cyclichthys cornutus* Kaup).

Chilomycterus spinosus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1749.

This species was not seen by us, but its distribution indicates that it may be expected on the Atlantic coast of Panama. Its relationship is imperfectly understood, but it seems to be distinguished from *C. antennatus* by the strongly elevated supraorbital ridge; by the large spot behind the pectoral; by 2 large black spots, one on each side of the dorsal; and by the absence of a large black spot on middle of nape. In structure it is said to agree with *C. schœpfi,* a more northern species, which, however, has a series of undulating blackish stripes running from the nape backward.

Recorded from the West Indies and from the coast of Brazil.

Family LXXI. **Scorpænidæ.**

THE ROCK-FISHES.

Body oblong, more or less compressed; head large, with one or more ridges above, terminating in spines; mouth terminal, usually large; teeth villiform, present on jaws and vomer and sometimes on palatines; premaxillaries protractile; maxillary broad, with a supplemental bone; gill-openings wide, the membranes free from the isthmus; scales rather small, ctenoid or cycloid; lateral line single, concurrent with the back; a narrow bony stay on cheek; dorsal fin continuous, sometimes quite deeply notched, with 8 to 16 spines and about an equal number of soft rays; anal fin with 3 spines and 5 to 10 soft rays; ventral fins thoracic, composed of I, 5 rays. Two genera are represented in the Panama collection.

KEY TO THE GENERA.

a. Dorsal spines normally 12; villiform teeth on palatines. *Scorpæna,* p. 833.

aa. Dorsal spines normally 13; no teeth on palatines. *Scorpænodes,* p. 845.

217. Genus **Scorpæna** Linnæus.

SCORPION FISHES.

Scorpæna Linnæus, Syst. Nat., Ed. X, 1758, 266 (type *Scorpæna porcus* Linnæus).

Body oblong, somewhat compressed; head large, usually not much compressed, more or less uneven with spines, mostly scaleless, sometimes with dermal flaps; mouth large, with bands of villiform teeth on jaws, vomer and palatines; scales moderate or small, ctenoid or cycloid, often with dermal flaps; dorsal fin normally with 12 strong spines; the anal with 3 strong spines; ventrals inserted behind pectorals; pectoral fins large, the base with procurrent rays, some or all of the upper rays normally divided. The dorsal spines are capable of inflicting a painful sting-like wound, not unlike that of a scorpion, hence the name scorpion fishes.

KEY TO THE SPECIES.

a. Occipital pit large, well developed.

b. A distinct pit below anterior margin of eye; head broad, quite as broad as deep.

c. Interorbital area broad, 4.2 to 5 in head; occipital pit very deep, prominent; axil usually black, with small white or pale blue spots. *plumieri*, p. 835.

cc. Interorbital area somewhat narrower, 5.28 to 8.25 in head; occipital pit shallow; axil brownish, usually with a large black spot and no pale spots. *mystes*, p. 836.

bb. No distinct pit under anterior margin of eye; head not broader than deep.

d. Suborbital stay with 2 or 3 distinct spines; axil of pectoral either with dark or pale bluish spots.

e. Anal spines graduated, the third anal spine longer but not stronger than the second; occipital pit open at sides; scales small, 55 to 60; axil of pectoral pale, with small round dark spots. *brasiliensis*, p. 837.

ee. Anal spines not graduated, the second spine longer and stronger than the third; occipital pit more or less closed at sides; supraorbital tentacles very long, always longer than eye; scales larger, 41 to 45; axil of pectoral gray, with very small bluish spots enclosed in black rings. *grandicornis*, p. 838.

dd. Suborbital stay without spines or merely ending in a spine posteriorly; no distinct spines on the stay under the eye; axil of pectoral pale or cloudy, not spotted.

f. Suborbital stay ending in a spine posteriorly; a large dermal flap present above base of pectoral; scales moderate, 43 on sides, many of them bearing dermal flaps.

g. Pectoral rays 19 in number, the lowest 8 simple, the next 10 branched, the uppermost one simple; maxillary not reaching posterior margin of eye, 2.25 in head; ventral rays reaching only to vent; a distinct dark spot on side behind opercular flap. *pannosa,* p. 839.

gg. Pectoral rays 20 in number, the lowest 11 or 12 simple, the next 7 or 8 branched, the uppermost simple; maxillary reaching beyond posterior margin of eye, 2 in head; ventral rays reaching beyond vent; no distinct dark spot on side behind opercular flap. *histrio,* p. 840.

ff. Suborbital stay entirely without spines; dermal flap above base of pectoral obsolete; scales rather small, 47; dermal flaps present on lateral line; pectoral rays 18, lower 10 simple, the next 7 branched, the upper one simple. *isthmensis* sp. nov., p. 842.

aa. Occipital pit scarcely developed, represented only as a slight quadrate depression.

h. Pectoral fins with 21 rays, the lower 14 simple, the next 6 branched, the uppermost one simple; longest dorsal spine not as high as the longest soft rays; head and occiput without dermal flaps. *russula,* p. 843.

hh. Pectoral fins with 19 rays, the lower 16 simple, the next 2 branched and the uppermost one simple; longest dorsal spine a little higher than the longest soft rays; head and occiput bearing numerous dermal flaps. *colonensis* sp. nov., p. 844.

602. Scorpæna plumieri Bloch.

Scorpæna plumieri Bloch, K. Vet. Ac. Nya Handl., X, 1789, 234 (Martinique); Günther, Cat. Fish. Brit. Mus., II, 1860, 113; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1848.

Scorpæna bufo Cuvier & Valenciennes, Hist. Nat. Poiss., IV, 1829, 306 (Martinique).

Scorpæna rascacio Poey, Syn. Pisc. Cub., 1868, 303 (Havana).

Head 2.2 to 2.5; depth 2.4 to 2.9; D. XII, 9 or 10; A. III, 5 or 6; scales 43 to 47.

Body elongate, moderately compressed; the back somewhat elevated; head large, usually quite as broad as deep; snout short and blunt, 3.2 to 3.8 in head; eye 3.6 to 5.5; interorbital 4.2 to 5; supraorbital with high ridge, bearing 3 short spines and usually, although not always, a fringed tentacle about as long as eye behind the second spine; a large quadrate pit at occiput; a small pit below and in front of eye;

suborbital stay continuous or with spines; preorbital with 2 divergent spines; a small spine slightly above and behind each anterior nostril; occiput with two series of spines; preopercle with 4 or 5 spines; opercle with 2 strong spines; mouth broad, oblique; maxillary broad, reaching beyond middle of eye, 1.85 to 1.95 in head; teeth in villiform bands on jaws, vomer and palatines; gill-rakers short and coarse, about 7 developed on the lower limb of first arch; scales rather small, present on part of opercles and on part of cheeks; breast fully scaled; lateral line complete, many of the pores with short dermal flaps; dorsal fin continuous, somewhat notched, its origin slightly in advance of upper anterior angle of gill-opening, the spines strong, the fourth the longest, longer than the soft rays; caudal fin moderate, with rounded margin; anal fin with 3 strong spines, the second the largest, longer and stronger than the largest dorsal spine; ventral fins inserted a little behind base of pectorals, reaching beyond vent; pectoral fins rather large, with broad bases, the lower rays decreasing rapidly in length, 1.4 to 1.7 in head.

Color dark brown above, paler below (chest and belly red in life); sides with large dark blotches, forming more or less distinct bars, the last one on base of caudal being narrow, quite distinct and forked on lower half of peduncle; the fins dark, with pale spots; the soft dorsal, caudal and anal with bars; axil of pectoral usually black, with white or pale blue spots.

This species is represented by 23 specimens, ranging in length from 75 to 260 mm. It is not abundant, although rather common, and it lives in shallow water usually where there is some vegetation. The junior author, while collecting at Porto Bello, had the misfortune of being "finned" by one of these fish. The poison which it injects is of a rather violent nature, as the spines piercing the thumb caused swelling of the entire hand and forearm, accompanied by severe pains throughout the hand and arm. The pain, however, lasted only a few hours and within 12 hours the swelling had gone down and, except for a little soreness in the wound on the thumb, no evil effects were apparent. This fish is occasionally seen in the Colon fish market but its commercial value is small, because of the small size attained and because it is not abundant.

Known from Massachusetts southward to Brazil. Our specimens are from Colon and Porto Bello.

603. Scorpæna mystes Jordan & Starks.

Scorpæna mystes Jordan & Starks, Proc. Cal. Ac. Sci., 2nd Ser., V, 1895, 491, Pl. LII (Mazatlan); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1849, Pl. CCLXXVII, fig. 671; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 161 (Panama Bay); Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 411 (Panama).

Head 2.25 to 2.4; depth 2.6 to 3.2; eye 3 to 5.6 in head; snout 3.4 to 4.75; interorbital 5.25 to 8.25; maxillary 1.9 to 2.1; D. XII, 10; A. III, 5; gill-rakers on lower limb of first arch about 5, besides 4 or 5 rudiments; scales 44 to 49.

This species is closely related to *S. plumieri,* from which it is distinguished with difficulty. The interorbital area, however, appears to be a little narrower and the quadrate pit at occiput is notably shallower. The axil is not wholly black, and it usually has only a large black spot. The small white spots in axil are much less numerous or frequently wanting. The tentacle above eye is variously developed or absent and is of no specific value.

The species is represented by 20 specimens, ranging in length from 40 to 270 mm. It is not infrequent in tide pools.

Known from Guaymas to Panama. Our specimens are from Taboga Island, Naos Island and Panama.

604. **Scorpæna brasiliensis** Cuvier & Valenciennes.

Scorpæna brasiliensis Cuvier & Valenciennes, Hist. Nat. Poiss., IV, 1829, 305 (Brazil); Günther, Cat. Fish. Brit. Mus., II, 1860, 112; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1842, Pl. CCLXXVII, fig. 670.

Scorpæna stearnsii Goode & Bean, Proc. U. S. Nat. Mus., 1882, 421 (Pensacola, Fla.).

Head 2.5 to 2.8; depth 2.6 to 3.15; D. XII, 10; A. III, 5; scales 55 to 60.

Body moderately compressed; the back elevated; head notably deeper than broad; snout rather blunt, 4 to 4.35 in head; eye 3.15 to 3.7; interorbital 5.5 to 7.4; supraorbital stay elevated, bearing 3 spines; a shallow quadrate pit at occiput, the ridges on sides of it not complete, leaving the pit open laterally; no pit below eye; preorbital with 2 divergent spines; a small sharp spine slightly above and behind each anterior nostril; occiput with 2 series of spines; preopercle with 4 spines; opercle with 2 strong spines; mouth moderate, slightly oblique; maxillary reaching a little beyond middle of eye, 1.9 to 2 in head; teeth in villiform bands on jars, vomer and palatines; gill-rakers very short, about 7 more or less developed on lower limb of first arch; scales small, present on chest, part of cheeks and most of opercles as well as on body; lateral line complete, with few short dermal flaps; dorsal fin rather deeply notched, its origin over upper anterior angle of gill-opening, the spines moderate, the fourth or fifth the longest, higher than the soft rays; caudal fin slightly rounded; anal fin with 3 graduated spines, the second stronger than the third, the third spine shorter than the longest dorsal spine; ventral fins inserted a little behind base of pectorals, reaching beyond vent in young, proportionately much shorter in adult; pectoral fins rather large, the lower rays decreasing rapidly in length, 1.2 in head.

Color in alcohol pale brownish, paler below, some indistinct dark blotches on upper part of sides; the posterior part of each scale darker; axil of pectoral pale, with small round dark spots, these also present on lower part of side behind pectoral; dorsal and anal irregularly marbled; caudal with a median and terminal blackish band; ventrals pale at base, bluish black at tips; pectorals mottled, faintly banded.

This species was not taken by us on the coast of Panama. It is here described from specimens in the National Museum collection from Key West, Florida, and Bahia, Brazil, ranging in length from 70 to 135 mm.

Known from North Carolina to Brazil; not recorded from the Isthmus of Panama.

605. Scorpæna grandicornis Cuvier & Valenciennes.

Scorpæna grandicornis Cuvier & Valenciennes, Hist. Nat. Poiss., IV, 1829, 309 (Martinique; Porto Rico; Havana; San Domingo); Meek & Newland, Proc. Ac. Nat. Sci. Phila., 1885 (1886), 396, 401; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1850, Pl. CCLXXVIII, fig. 672.

Head 2 to 2.6; depth 2 to 2.6; D. XII, 9 or 10; A. III, 5 or 6; scales 41 to 45.

Body elongate, rather strongly compressed; the back elevated; head rather narrow, somewhat deeper than broad; snout blunt, 3.2 to 4.4 in head; eye 3 to 3.85; interorbital 5.5 to 6.3; supraorbital greatly elevated, bearing 3 spines; a long fringed dermal tentacle behind the second spine, the tentacle varying in length among specimens, but always notably longer than eye, none as long as in specimens examined from Key West; a quadrate pit at occiput; no distinct pit below and in front of eye; suborbital stay usually with processes; preorbital with 2 blunt divergent spines; a small spine slightly above and behind each anterior nostril; occiput with several spines on each side; preopercle with 4 or 5 spines; opercle with 2 strong spines; mouth rather broad, oblique; maxillary reaching a little beyond middle of eye, 1.9 to 2.1 in head; teeth in villiform bands, present on jaws, vomer and palatines; gill-rakers short and blunt, with many spinules, about 6 developed on the lower limb of the first arch; scales rather small, present on part of opercle and on part of cheek; lateral line complete, with a series of dermal flaps equal to or longer than half the eye; dorsal fin continuous, somewhat notched, its origin a little in advance of gill-opening, the spines strong, the third or fourth the longest, higher than the soft rays; caudal fin round; anal fin with 3 strong spines, the second the longest, also somewhat longer than the longest dorsal spine; ventrals inserted nearly half an eye's diameter behind base of pectorals, reaching well beyond vent; pectoral fins large, with broad bases, the lower rays decreasing in length rather less abruptly than in *S. plumieri,* 1.1 to 1.25 in head.

Color grayish brown above, paler below; a dark vertical band below eye extending over interorbital; dark band extending across base of pectoral and across spinous dorsal; a third band on tips of pectorals to last spines of dorsal; a fourth dark band from base of second anal spine to near middle of soft dorsal; a fifth bar on caudal peduncle; a faint dark bar at base of spinous dorsal back to fifth spine; soft dorsal with 2 bars; caudal fin with 2 dark bars; anal with 3 dark bars; ventrals with black tips; pectorals very dark, with 3 black bars, the axil gray, with very small bluish spots enclosed in black rings; the lower surface of head and chest usually with pale spots.

Twenty-two specimens, ranging in length from 50 to 135 mm., were preserved. This species is a little less common than *S. plumieri* but it is usually found in company with the latter.

Known from Massachusetts to Brazil. Our specimens are from Colon and Porto Bello.

606. Scorpæna pannosa Cramer.

Scorpæna pannosa Cramer, in Gilbert, Proc. U. S. Nat. Mus., 1897, 446, Pl. LII (Panama); Jordan & Evermann, Bull. U. S. Nat Mus., XLVII, 1898, 1845; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 161.

Head 2.25; depth 3; D. XII, 10; A. III, 5; scales 43.

Body compressed; head about as wide as deep; eye placed high, 4.2 in head; interorbital space narrow, deeply concave, 2 in eye; supraocular ridges thin, with blunt spines; occipital pit of moderate depth, continuous on each side; spines at anterior nostrils sharp and strong; no pit under eye; preorbital with two spines, one directed forward, the other downward; suborbital stay with 3 or 4 points; preopercle with 5 spines, the upper one largest; opercle with two diverging spines; mouth large, nearly horizontal; maxillary reaching about to posterior margin of pupil, 2.25 in head; teeth in broad bands on jaws, vomer and palatines; gill-rakers very short, with many minute points, about 6 developed on lower limb of first arch; scales moderate, present on lower part of cheeks and on base and flap of opercle, many of them with dermal flaps; dorsal fin not deeply notched, its origin over upper anterior angle of gill-opening, the third and fourth spines longest, scarcely longer than the longest soft rays; caudal fin truncate or very slightly rounded; anal with 3 spines, the second one the largest, not quite as long as the longest soft rays, the soft rays not quite reaching the base of caudal; ventral fins reaching vent; pectoral fins large, reaching nearly to origin of anal, rays 19, the lower 8 simple, the next 10 branched, the upper one simple; a broad flap above base of pectoral, with tattered margin.

Color probably scarlet in life; no white spots on side of body; cheeks mottled with small, dark, mostly round spots; 2 narrow dark bars on side under spinous dorsal and a broader one under soft dorsal; no trace of dark bar on caudal peduncle; a large dark spot on side behind opercular flap; dorsal and pectorals pale, with slight cloudings of dark spots; axil of pectorals pale, with 3 or 4 dark spots; caudal fin with 2 faint cross-bars or dark spots, faint white spots on the lighter bands.

This species was not secured by us. The above description is based on the type, a specimen 190 mm. in length, which we have examined, and which appears to be the only specimen known.

Recorded only from Panama Bay where it was taken by the Albatross.

607. Scorpæna histrio Jenyns.

Scorpæna histrio Jenyns, in Darwin, Zoöl. Voy. Beagle, Pt. IV, Fish, 1842, 35, Pl. VIII (Chatham Island, Galapagos Archipelago); Günther, Cat. Fish. Brit. Mus., II, 1860, 115; Jordan & Bollman, Proc. U. S. Nat. Mus., 1889, 182 (Panama); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1843; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 161.

Head 2.15; depth 3.1; D. XII, 10; A. III, 5; scales 43.

Body elongate, compressed; head large, its depth and width equal; interorbital narrow, 2 in orbit; supraocular ridges thin, high, with very blunt spines; preopercular ridges very thick, prominent, with strong spines; postocular spines on rim of orbit, external and posterior to supraoculars; another small spine on rim of orbit below and a little behind postocular; the bifid spine a little behind middle of posterior margin of orbit, and behind this a small exoccipital spine; a pair of sharp "coronal" spines with small pits in front of them; thin, rather high parietal and nuchal ridges with blunt spines; occiput with a moderate pit, continuous on each side between "coronal" spine and parietal ridge, with a pit behind superior posterior border of orbit; nasal spines strong; preorbital very wide, with 2 or 3 small spines; no pit under orbit, but a broad shallow depression under whole length of orbit; uppermost preopercular spine longest, with a small spine above its base, the second, third and fourth spines successively smaller, the fifth obsolete; opercle with two strong spines; mouth very large, nearly horizontal; maxillary reaching beyond posterior edge of orbit, 2 to 2.1 in head; broad bands of teeth on jaws, vomer and palatines; gill-rakers very short, broad, about 8 developed; scales moderate, mostly cycloid; small embedded scales behind orbit on base of opercle and below suborbital stay; many of the scales on sides with dermal flaps; dorsal fin somewhat notched, its origin opposite upper angle of gill-opening; third and fourth spines equal, the longest twice as long as first; longest soft rays about equal to longest spine; caudal truncate; second anal spine longest; ventrals reaching a little beyond vent; pectorals reaching nearly to anal, the uppermost ray simple, the next 8 or 9 branched, the lower 11 or 12 simple; a broad flap above base of pectoral, its edge nearly smooth.

Color in alcohol: Top of head and sides dark brown, with a slight wash of cherry-red; belly white; cheeks under eyes mottled with light and dark; soft dorsal dark; membrane of spinous dorsal and base of soft dorsal strongly washed with cherry-red; a dark spot on opercular flap; some of the flaps on the sides of the same color, others white; pectorals with 3 dark bars, alternating with lighter; axil cloudy; caudal with 2 broad dark bars, the lighter bands much mottled with white; posterior part of sides with several white spots; a narrow black band across top of peduncle just in front of caudal.

This species was not secured by us but it has been taken in Panama Bay by the Albatross. The description here given is based upon published accounts and upon a few large specimens which we have examined in the National Museum.

Known from Juan Fernandez, Galapagos Archipelago, Chinchas Island, Panama Bay, and southward to Peru.

608. Scorpæna isthmensis sp. nov. (Plate LXXX.)

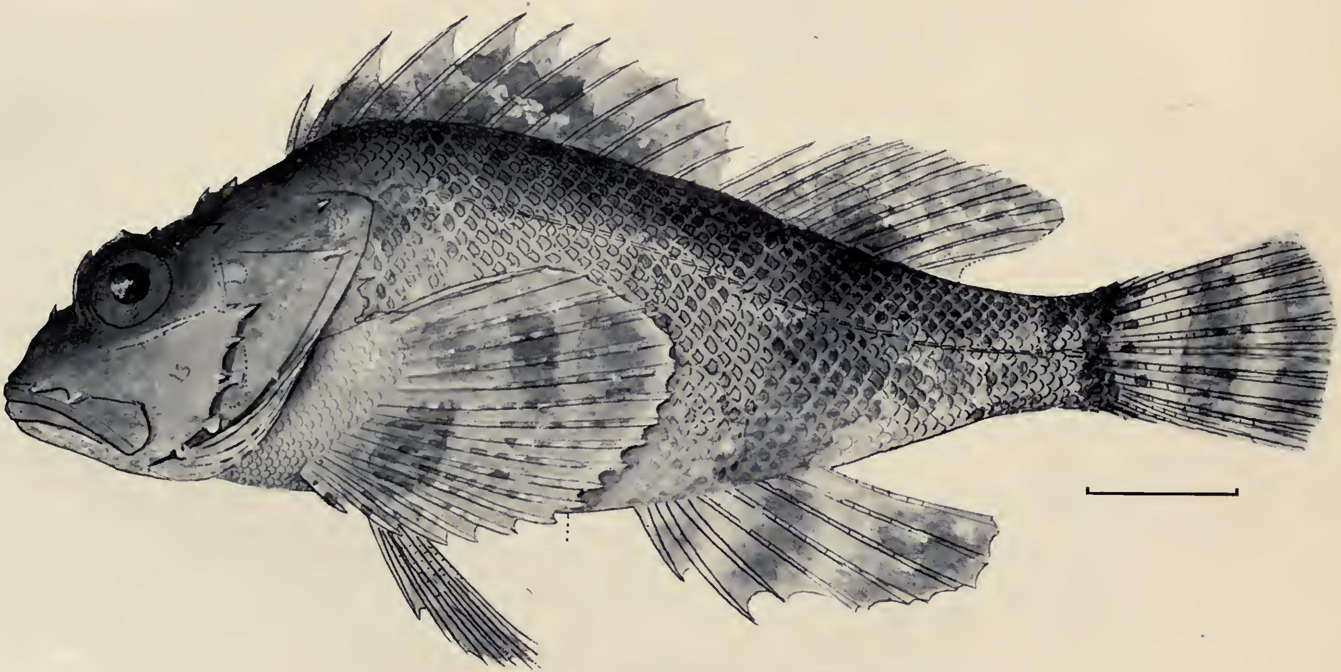
Type No. 81617, U. S. N. M.; length 90 mm.; Porto Bello, Panama.

Head 2.5; depth 2.7; D. XII, 10; A. III, 5; scales 47.

Body rather robust; head somewhat deeper than broad; snout broad, 3.4 in head; eye 3.4; interorbital deeply concave, 7.7; suborbital stay evident, bearing no spines; the rest of the armature of the head identical with *S. brasiliensis;* mouth rather large, slightly oblique; maxillary reaching nearly to posterior margin of eye, 1.8 in head; teeth minute, in bands on jaws, vomer and palatines; gill-rakers very short and blunt, with strong bristles, 5 somewhat developed on lower limb of first arch; scales moderate, present on chest, part of the cheeks and opercles as well as on body; lateral line with few short dermal flaps, none on scales elsewhere; dorsal fin deeply notched, the membrane attached to less than a third of the last spine, the spines moderate, the third or fourth the longest, about equal to the longest soft rays; caudal fin nearly square posteriorly, notably longer than snout and eye; ventral fins rather long, reaching past vent; pectoral fins large, the upper ray simple, the next 7 branched and the lower 10 simple, the longest rays 1.2 in head; a very small flap above base of pectoral, its margin adnate and entire.

Color in alcohol dark brown above, paler brown on lower part of sides; chest and abdomen pale; many of the scales on sides with small black spots; a trace of a dark bar from base of pectoral across spinous dorsal; a second dark bar on anterior part of anal, across body and extending on anterior soft rays of dorsal; a third dark bar at base of caudal, another dark bar on median portion of caudal and one on the distal portion; lower part of sides with faint pale spots; lower surface of head speckled with white; ventral fins pale brown at base, the distal parts black; axil of pectoral pale brownish, unspotted, the fin exteriorly with indications of a black bar at base and another on median portion, the rays with pale markings.

We have a single specimen, 90 mm. long, which appears to represent a new species. Its relationships are with *S. histrio* and *S. pannosa,* from which it differs in having a smooth suborbital stay which does not end in a spine posteriorly; flap above base of pectoral small, adnate, with smooth margin; no dermal flaps on scales, except along lateral line; scales somewhat smaller; color somewhat darker, many of the scales on sides with black spots. From *S. bergii* Evermann & Marsh (Bull. U. S. Fish Comm., XX, Pt. I, 1900 (1902), p. 276, fig. 83) it differs in having one more spine in the dorsal; the anal spines are gradu-



SCORPÆNA ISTHMENSIS sp. nov.
Drawn from the type 90 mm. in length.

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ated, the second not longer than the third, as in *S. bergii;* the caudal fin is notably longer, and the mouth is larger.

Our specimen and type is from Porto Bello.

609. **Scorpæna russula** Jordan & Bollman.

Scorpæna russula Jordan & Bollman, Proc. U. S. Nat. Mus., 1889, 165 (Albatross Stations 2795 & 2797, in Panama Bay, 33 fathoms); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1851; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 161.

Head 2.3 to 2.5; depth 3.2 to 3.7; D. XII, 10; A. III, 5; scales 45 to 47.

Body robust, compressed; the back little elevated; snout 4.5 in head; eye 3.5; interorbital narrow, its width a little less than ⅓ eye, 9.5 in head; preocular spine very prominent, larger than others on top of head; supraocular tentacle disappearing in adult; supraocular spine not as strong as postocular and tympanic, which are close together, the latter followed by a low striate ridge bearing the low occipital and nuchal spines; no coronal spines; temporal ridge prominent, ending in a spine, and with two blunt spines in front; below these and about halfway to suborbital stay another small and blunt spine; preorbital with 2 large spines in front; suborbital stay with a prominent ridge bearing a small spine below anterior margin of pupil, and 2 more behind posterior margin; nasal spines short and sharp; occipital and suborbital pits absent; preopercle with 4 distinct spines and 4 smaller projections, the largest spine with a small one immediately below; 2 large, sharp opercular spines; mouth large; maxillary reaching posterior margin of pupil, 2 in head; gill-rakers short and thick, 5 or 6 developed; scales small, scarcely ctenoid, those on belly much reduced; membrane of opercle with a few scales, the opercle itself naked; scales of body without fleshy flaps; dorsal spines not as high as soft rays, the fin deeply notched; second anal spine longest; pectorals long, the lower 14 rays simple, the next 6 branched, the uppermost one simple; ventrals reaching vent; caudal equal to pectoral.

Color dark brown above, probably crimson in life, pale below level of upper half of pectorals; upper half of head dark but without any distinct spots; the back more or less mottled with dusky; spinous dorsal with a dusky band at base and another across its middle; soft dorsal dark at base, with 3 or 4 irregular rows of small obscure brownish spots; caudal tipped with black, traces of a narrow dark bar across its middle; pectorals slightly tipped with black, the middle slightly mottled; ventrals and anal pale or with traces of black on tips of rays.

This species was dredged in Panama Bay by the Albatross. It was not seen there by us but we have examined some of the "types."

Known only from Panama Bay.

610. Scorpæna colonensis sp. nov. (Plate LXXXI, fig. I).

Type No. 81606, U. S. N. M.; length 42 mm.; tide pools, Colon.

Head 2.2; depth 2.33; D. XII, 10; A. III, 5; scales 44.

Body rather short, deep, compressed; the back elevated; head nearly as broad as deep; snout blunt, 3.35 in head; eye 4.3; interorbital 4.3; supraorbital ridge not greatly elevated, bearing 3 spines and no filament; only a slight depression at occiput; no pit below eye; suborbital stay with 3 processes; preorbital with 3 spines; a small spine above and behind each anterior nostril; occiput with 2 series of spines on each side; preopercle with 5 spines; opercle with 2 strong spines; mouth broad, oblique; maxillary reaching posterior margin of pupil, 1.9 in head; teeth in villiform bands on jaws, vomer and palatines; gill-rakers very short, about 6 more or less developed on lower limb of first arch; scales moderate, present on opercles and cheeks, nearly the entire head covered with short dermal flaps, these also present on sides above lateral line; lateral line complete; dorsal fin notched, its origin over upper anterior angle of gill-opening; the dorsal spines strong, of unequal length, the median ones longest, scarcely higher than the soft rays; caudal fin round; anal fin with 3 rather long, slender spines, the second one reaching beyond the tip of the third when deflexed, about a half longer than eye, notably longer than the longest dorsal spines; ventrals inserted a little behind base of pectorals, reaching beyond vent; pectoral fins large, with 19 rays; the upper pectoral ray simple, the next 2 branched, the longest rays 1.85 in head.

Color in alcohol brownish, somewhat paler below than above; caudal peduncle pale; sides with 3 dark vertical bars; one bar from behind base of pectoral extending on spinous dorsal, and a second one on anterior part of anal across body and on anterior part of soft dorsal; a third bar which is divided below is situated on base of caudal; lower surface of head with small pale gray spots; dorsal and anal fins pale, except where crossed by body bars, but with dark spots; caudal fin pale, with 2 dark vertical bars; ventral fins very dark brown, with pale margins; pectoral fins dark, with small gray spots and pale margins; the axil brown, unspotted.

We have a single specimen, 42 mm. long, which appears to represent a new species. It is more closely related to *S. inermis* Cuvier & Valenciennes than any other species known to us, but the body is deeper,

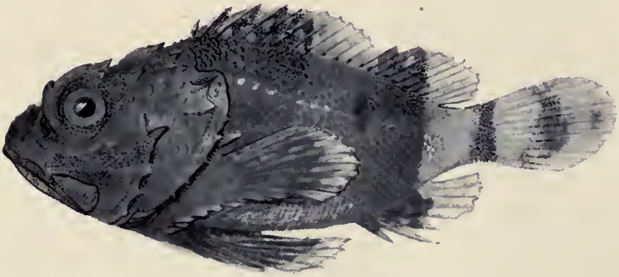

FIG. 1. SCORPÆNA COLONENSIS sp. nov
From the type 42 mm. in length.

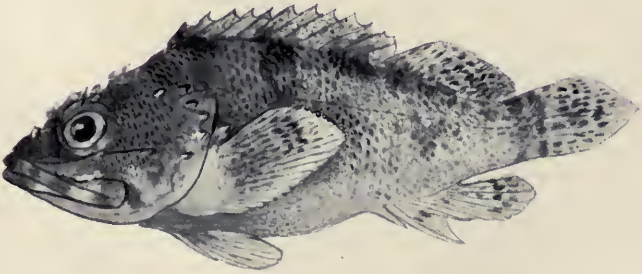

FIG. 2. SCORPÆNODES XYRIS (Jordan & Gilbert).
From a specimen 92 mm. in length.

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eye smaller, interorbital much broader, the second anal spine is notably longer and the head and occiput bear numerous dermal flaps.

Our specimen was taken from a tide pool at Colon.

218. Genus **Scorpænodes** Bleeker.

Scorpænodes Bleeker, Nat. Tijds. Ned.-Ind., XIII, 1857, 371 (type *Scorpæna polylepis* Bleeker).

Sebastopsis Gill, Proc. Ac. Nat. Sci. Sci. Phila., 1862, 278 (type *Scorpæna polylepis* Bleeker).

Sebastopsis Sauvage, Ann. Sci. Nat., Zool., V, 1873 1 (type *Sebastes minutus* Cuvier).

Palatine teeth wanting; dorsal spines 13; no dermal flaps on scales. Two species, one each from the Atlantic and Pacific coasts, are represented in the Panama collection. A new species (*tredecimspinosa*) belonging to this genus has been described from the Dutch West Indies by Metzelaar (1919, p. 146, fig. 1) under the generic name *Scorpæna*.

KEY TO THE SPECIES.

a. Dorsal fin with 10 soft rays; second anal spine about as long as eye and snout; longest dorsal spine not higher than the longest soft rays. *xyris*, p. 845.

aa. Dorsal fin with 8 soft rays; second anal spine about as long as snout and half the eye; longest dorsal spine higher than the longest soft rays. *caribbæus* sp. nov., p. 847.

611. Scorpænodes xyris (Jordan & Gilbert). (Plate LXXXI, fig. 2.)

Sebastopsis xyris Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 369 (Cape San Lucas); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1835.

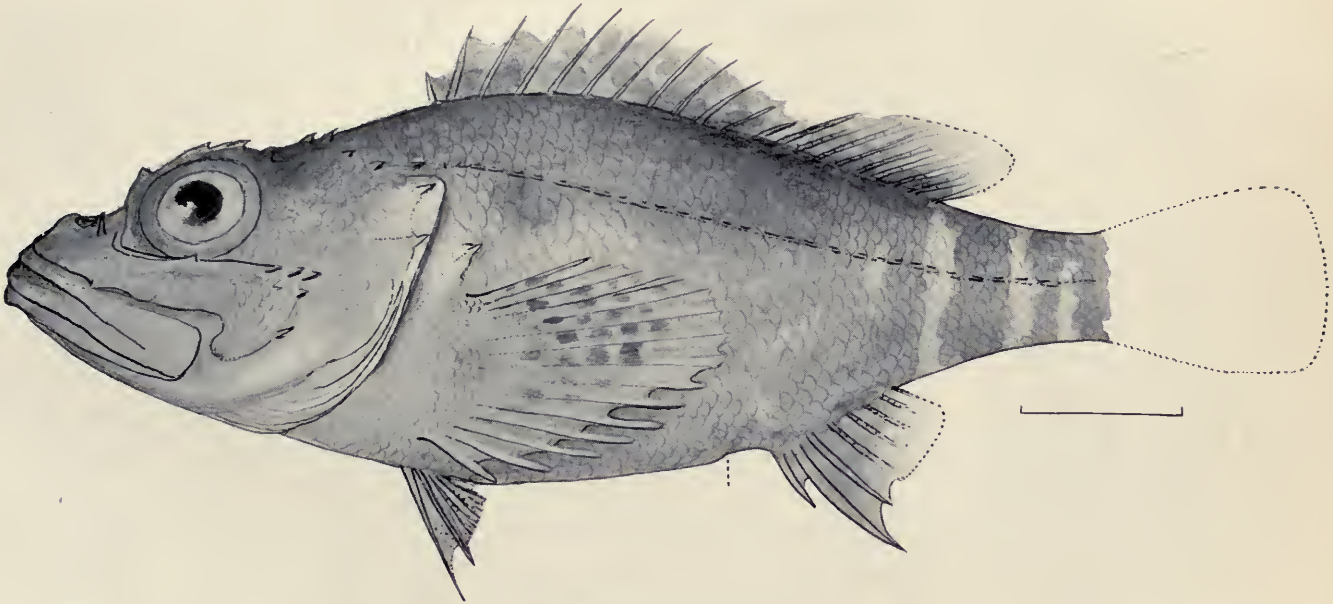
Head 2.35 to 2.55; depth 2.35 to 2.9; D. XIII, 10; A. III, 5; scales 44 to 50.

Body moderately elongate, compressed; the back elevated; head moderate, deeper than broad; snout short, 3.55 to 4.6 in head; eye 3.1 to 4.15; interorbital 5.75 to 8.6; supraorbital ridge rather prominent, bearing 3 spines, the median one with a dermal tentacle about as long as pupil; no occipital pit; an elongate depression below the eye, but no pit; suborbital stay with 3 points; preorbital with 3 blunt points; nostril spine quite small; occipital region with 2 more or less definite series of spines; preopercle with 3 spines, the uppermost largest, with an auxiliary spine on its base; opercle with 2 rather prominent spines; shoulder girdle above base of pectoral with 1 strong spine, and 2 at origin of lateral line; mouth quite broad, oblique; maxillary reaching nearly opposite posterior margin of eye, 1.7 to 1.9 in head; teeth on jaws in villiform bands, a small patch of villiform teeth on vomer, none on palatine; gill-rakers short and slender, about 5 more or less developed on lower limb of first arch; pseudobranchiæ large; scales small, finely ctenoid, present on entire body except on interorbital space, snout and mandible; no dermal flaps except on scaleless portions; lateral line prominent, slightly interrupted at base of caudal, missing on a few scales; dorsal fin deeply notched, its origin slightly in advance of upper anterior angle of gill-opening, the spines slender, pungent, the fifth or sixth the longest, not quite as high as the longest soft rays, about equal to diameter of eye; caudal fin rounded; anal fin with 3 strong spines, the second notably enlarged, reaching well beyond the tip of the third when deflexed, nearly or quite as long as snout and eye, the soft rays as long as the second spine; ventral fins moderately long, reaching nearly or quite to vent in young, shorter in adult, inserted under base of pectorals; pectoral fin rather broad, with 18 rays, the uppermost ray unbranched, the next 7 branched, the rest simple, the longest rays 1.2 to 1.6 in head.

Color in alcohol brownish, with indefinite dark markings; no distinct bars except on caudal peduncle; the peduncle with 2 rather distinct dark bars; small specimens 40 mm. long with an indefinite bar from base of anal to anterior part of soft dorsal; 3 dark blotches on back extending on the fin; a dark bar in advance of dorsal, less distinct on some of our larger specimens, yet plainly visible; an indefinite bar extending from eye across tip of maxillary to opercular margin; some specimens having a definite round black spot on subopercle; small dark spots on the dorsal and anal fins in addition to the blotches already mentioned evident; caudal fin with a dark bar at base and with dark spots on the rays, forming indistinct wavy cross-bars; ventral fins with a few dark spots, sometimes merely partly dusky; pectoral fins with dark spots, the axil colored like the rest of the lower part of side.

Nine specimens of this species, ranging in length from 35 to 90 mm., were collected. The second anal spine in our specimens, as well as in the "types" which we have examined, is notably longer and stronger than the third, not the reverse as stated by Jordan & Evermann.

Recorded from the Pacific coast of Mexico and the neighboring islands, also from the Revilagigedo and Galapagos archipelagos and now for the first time from Panama Bay. Our specimens were taken on the rocky shores of the small islands in Panama Bay near Balboa.



SCORPÆNODES CARIBBÆUS sp. nov.
Drawn from the type 63 mm. in length.

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612. Scorpænodes caribbæus sp. nov. (Plate LXXXII.)

Type No. 81619, U. S. N. M.; length 63 mm.; Toro Point, Canal Zone.

Head 2.2; depth 2.6; D. XIII, 8; A. III (5)?, injured; scales 42.

Body rather deep, compressed; head moderate, not quite as broad as deep; snout short, broad, 3.65 in head; eye 3.65; interorbital 8.3; supraorbital ridge rather prominently elevated, bearing 3 spines and no dermal flaps; no occipital pit; an elongate groove below eye, but no pit; suborbital stay with 3 spines, the anterior one with 2 short processes below it; preorbital with 3 very short blunt points; nostril spine well developed; occipital region with 3 more or less distinct series of spines; preopercle with 3 spines, the uppermost longest and in line with suborbital stay; opercle with 2 strong diverging spines; shoulder girdle with a prominent spine just above base of pectoral, and 2 at origin of lateral line; mouth broad, oblique; maxillary reaching middle of eye, 2.2 in head; teeth on jaws in villiform bands; and a small patch of vomerine teeth; no palatine teeth; gill-rakers short and slender, 7 more or less developed on lower limb of first arch; pseudobranchiæ well developed; scales rather small, finely ctenoid, present on entire body, except interorbital space, snout and mandible; lateral line prominent, apparently wanting on a few scales at base of caudal; dorsal fin rather deeply notched, its origin over upper posterior angle of gill-opening, the spines rather strong, the fifth or sixth the longest, higher than the soft rays, about equal to diameter of eye; caudal fin injured in life, probably normally rounded; anal fin with 3 spines, the second spine greatly enlarged, much longer and stronger than the third, also much larger than the longest dorsal spines, about equal to length of snout and half the eye, the soft rays injured; ventral fins very short (probably injured and not of normal length), inserted under base of pectorals; pectoral fins moderate, with 18 rays, the uppermost 3 simple, the next 6 branched, the rest simple but somewhat thickened at the ends, the longest rays 1.7 in head.

Color in alcohol brown; sides with paler areas, but without evident bars, except the one on base of caudal; a dark bar under eye and a dark blotch on preopercle below posterior part of eye; an indefinite dark blotch on upper part of opercle; an indication of a dark bar across head behind eyes, apparently slightly connected with spot on preopercle; dorsal fin dark, with irregular pale spots; ventral fins dusky; pectoral fins pale gray, with distinct small roundish black spots; axil of pectoral plain light brownish.

A single specimen, 63 mm. long to base of caudal, was taken. It is unfortunate that this specimen, which apparently represents a new species, is imperfect. It evidently met with an accident or disease during life which injured the caudal and anal fins and probably the ventral fins also. An attempt at regeneration has been made, but the rays have not reached the normal length and are somewhat twisted and more or less united. The body itself appears to have escaped injury and is undoubtedly normal.

Our specimen was taken on a coral reef at Toro Point.

Family LXXII. **Triglidæ.**

THE GURNARDS.

Body elongate, usually more or less fusiform; head with a coat of mail, consisting of rough bony plates, some of the plates at least armed with spines; the suborbital stay prominent; eyes placed high; mouth terminal or subinferior; premaxillaries protractile; maxillary without supplemental bone, slipping under the preorbital; teeth very small, in bands on jaws, vomer and usually on palatines; gills 4, a slit behind the fourth; gill-rakers various; gill-membranes free from the isthmus; pseudobranchiæ present; scales or bony plates on body; dorsal fins 2, the first with spines only, short, the second with soft rays only, similar to the anal; caudal fin rather narrow, with rather few rays; ventral fins thoracic, far apart, with I, 5 rays; pectorals large, often quite long, the 3 lowermost rays free, forming feelers.

A single genus is represented in the Panama fauna.

219. Genus **Prionotus** Lacépède.

Prionotus Lacépède, Hist. Nat. Poiss., III, 1802, 336 (type *Trigla evolans* Linnæus).

Ornichthys Swainson, Nat. Hist. & Class. Fish., II, 1839, 262 (type *Trigla punctata* Bloch).

Chriolax Jordan & Gilbert, Proc. U. S. Nat. Mus., 1878, 374 (type *Trigla evolans* Linnæus).

Body subfusiform; head large; snout broad, much longer than the small eye; surface of the head entirely bony, the bones rough with ridges, granules and spines; preopercle with 1 or 2 spines at its angle; opercle with 1 sharp spine; 1 spine on shoulder girdle; mouth broad; teeth small, granular, in bands on jaws, vomer and palatines; gill-membranes nearly separate, free from the isthmus; gill-rakers moderate;

lateral line continuous; scales small, more or less rough, wanting or few on head, sometimes wanting on crest; dorsal fins separate, the first with 8 to 10 spines; anal fin similar to soft dorsal; ventral fins far apart, with flat space between them, composed of I, 5 rays; pectoral fins with 3 lower anterior rays separate from the rest of fin and entirely free from each other. Some of the gurnards live in rather deep water but others are regularly taken in shallow water along the shores. Only 3 species are represented in the Panama collection, but several others have been included in this report because their distribution brings them within the scope of this work.

KEY TO THE SPECIES.

a. Suborbital ridge or stay with a spine at the center of radiations on cheek.

b. A definite transverse groove on head behind eyes; anal fin with 12 rays; pectorals reaching past middle of anal, not quite half the length of body. *punctatus,* p. 850.

bb. No transverse groove on head behind eyes; pectoral fins reaching little if any beyond origin of anal, about 3.5 in length of body.

c. Scales firm, strongly ctenoid, notably rough to the touch; vomerine teeth in 2 patches, usually well separated on median line; A. 11. *ruscarius,* p. 850

cc. Scales thin, scarcely ctenoid, not rough to the touch; vomerine teeth in continuous band; A. 10. *horrens,* p. 852.

aa. Suborbital ridge or stay without a spine at center of radiations on cheek.

d. A groove across head behind eyes; body robust, the depth about 3.5 in length.

e. Preopercular spine with a small spine at base, dorsal spines 8. *xenisma,* p. 854.

ee. Preopercular spine without small spine at base; dorsal spines 10. *loxias,* p. 855.

dd. No groove across head behind eyes; body elongate, rather slender, the depth 4 to 4.5 in the length.

f. Pectoral fins of moderate length, reaching a little beyond middle of base of dorsal, 2.2 to 2.4 in body; interorbital deeply concave, very narrow, 7.5 to 9 in head; scales small, about 100 in a longitudinal series. *aspersus* sp. nov., p. 856.

ff. Pectoral fins long, reaching opposite base of last rays of dorsal, about 2 in body; interorbital broader and less deeply concave, 4.5 to 6.5 in head; scales larger, about 60 to 70 in a longitudinal series.

g. Maxillary reaching slightly beyond anterior margin of eye, 2.5 in head; bands of palatine teeth narrow; gill-rakers long and slender, about ½ diameter of eye, 8 well developed on lower limb of first arch; interorbital space not deeply concave, rather wide, 4.65 to 5 in head. *quiescens*, p. 857.

gg. Maxillary failing to reach front of eye, 2.75 in head; bands of palatine teeth rather broad; gill-rakers short, about ⅓ diameter of eye, about 5 well developed on lower limb of first arch; interorbital space rather deeply concave, narrow, 6.5 in head. *albirostris*, p. 858.

613. Prionotus punctatus (Bloch).

Trigla punctata Bloch, Naturg. Ausl. Fische, VII, 1793, 125, Pl. CCCLIII (Martinique).

Prionotus punctatus Cuvier & Valenciennes, Hist. Nat. Poiss., IV, 1829, 93; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2169.

"Head 2⅘; depth 2⅘; eye 6 in head. D. X-12; A. 12; about 50 pores in lateral line. Body stout; head large; preopercular spine with a smaller one at its base; pectorals reaching past middle of anal, their length not quite ½ the body; gill-rakers rather long and slender, about 10 developed; maxillary 2½ in head; a bluntish spine on edge of snout behind the serræ; behind this 1 or 2 smaller ones, at least in the young; no spine on cheek bone; groove behind the eye evident; interorbital area rather narrow, concave; preocular, supraocular, occipital and nuchal spines rather prominent; dorsal spines high, the third 2⅓ in head; first spine not serrate; mouth large, maxillary 2½ to 2⅖ in head, and reaching nearly to the eye; a small spine on center of radiation of cheek and one before it. Color nearly plain; spinous dorsal with dark clouds and without black ocelli; pectoral dark, with some round brown spots above; caudal dark barred; a whitish area on back between dorsals." (Jordan & Evermann.)

This species was not seen by us. The authors of the above description state that it was based on 2 small specimens collected on the east coast of Mexico. The species is not yet known from the coast of Panama, but its range brings it within the scope of the present work.

Known from West Indies, east coast of Mexico, Brazil and Uruguay.

614. Prionotus ruscarius Gilbert & Starks.

Prionotus birostratus Jordan, Proc. U. S. Nat. Mus., 1885, 387 (not *P. birostratus* Richardson).

Prionotus horrens Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2172 (in part; not *P. horrens* Richardson).

Prionotus ruscarius Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 165, Pl. XXVII, figs. 50 and 50a (Panama Bay; Mazatlan; Magdalena Bay, L. C.).

Head 2.35 to 2.7; depth 3.35 to 4.15; D. X-12; A. 11; scales 96 to 107.

Body quite elongate, scarcely compressed; head rather short, broader than deep; snout depressed, broader than long, 2.1 to 2.4 in head; eye 4.15 to 6.4; interorbital deeply concave, 3.95 to 4.3; mouth broad; maxillary reaching nearly to anterior margin of eye, 2.3 to 2.57 in head; vomerine teeth in 2 separate patches, usually well separated on median line; a prominent ridge from snout to preopercular spine; serrations on snout; 4 flat spines on ridge on side of head; these spines, as well as all the others on the head, always much more prominent in the young than in the adult; supraorbital ridge quite high, bearing 1 spine over anterior part of eye and 2 over the posterior part in the adult, a minute one projecting into a notch in the immediate bony rim of the orbit and a larger one farther removed from the rim; young with a single spine as in *P. horrens;* the ridges and granules, the humeral, opercular and occipital spines and ridges all coarser and somewhat more prominent than in *P. horrens*; gill-rakers rather slender, about 6 developed on lower limb of first arch; scales small, firm, strongly ctenoid, notably rough to the touch; the breast in some specimens largely naked, in others with only a small naked area anteriorly and at base of each ventral; spinous dorsal prominently elevated, its origin slightly in advance of margin of opercle, the second spine longest, notably longer than the longest soft rays, equal to length of snout and one-third eye, the posterior spine scarcely as long as pupil; caudal fin gently concave, the upper rays slightly longer than the lower ones; anal fin not quite as high as the soft dorsal, its origin a little posterior to that of the second dorsal; ventral fins not quite reaching vent in adult, to or beyond vent in young; pectoral fins moderate, reaching beyond tips of ventrals, nearly or quite to origin of anal, 3.3 to 3.95 in body.

Color in alcohol dark brown on back and sides, white below; a faint ill-defined dark bar under spinous dorsal and another slightly more distinct under posterior half of soft dorsal; dorsal fins translucent, the anterior part of spinous dorsal usually dark brown; soft dorsal brownish posteriorly, or at least with brownish spots, the margin of the membranes blackish; caudal fin with dark spots, forming irregular cross-bars, the distal fourth of the membranes mostly black; anal and ventrals pale;

pectorals dark brown or dusky, with a large pale blotch on the median connected rays of the distal third of the fin, the membranes of posterior margin of fin black.

This species and *P. horrens* are about equally abundant, both were frequently seen in the Panama City market and they are of limited commercial value. We preserved 14 specimens of the present species, which range from 42 to 275 mm. in length. This species and *P. horrens* are rather closely related, yet upon careful inspection numerous minor differences are noticed. The most evident character differentiating the two species is the difference in the scales. *P. ruscarius* has firm and strongly ctenoid scales which are decidedly rough to the touch when the fingers are passed over them from the tail forward. The scales in *P. horrens* are less firm, thinner and only slightly ctenoid, never rough to the touch. The anal fin constantly has one more ray in *P. ruscarius,* not 2 as stated by Gilbert & Starks. The last 2 rays of the anal are very close together in both species and it is probable that in one instance these closely connected rays were counted as 1 and in the other as 2. Gilbert & Starks also give a difference of 1 ray in the soft dorsal for these species, but all of our specimens of both species have 12 rays. It, again, is quite probable that in *P. ruscarius* the last 2 rays of this fin which also are closely connected were counted as 2 while in *P. horrens* they were considered as 1 ray. The adults of *P. ruscarius* have 2 spines over the posterior part of orbit, a minute spine projecting into a notch in the immediate bony rim of orbit and a larger one farther removed. The young, however, have a single spine as in *P. horrens.* The vomerine teeth in *P. ruscarius* are in 2 patches, usually being well separated on median line, while in *P. horrens* they are in a continuous band. *P. ruscarius* has somewhat coarser sculptering on the head, the spines are all somewhat longer and stronger, and the interorbital is more deeply concave. These differences, however, are evident only when specimens of like size are compared. The emargination of the snout does not appear to be of specific value, as it varies greatly in both species.

Known from Magdalena Bay, L. C., to Panama Bay. The specimens at hand were taken at Chame Point, Taboga Island, Balboa and Panama.

615. Prionotus horrens Richardson.

Prionotus horrens Richardson, in Hinds, Zoöl. Voy. Sulphur, Ichth, 1845, 79, Pl. XLII, figs. 1-3 (Gulf of Fonseca); Günther, Cat. Fish. Brit. Mus., II, 1860, 195; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2172 (in part); Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 162 (Panama).

Head 2.25 to 2.5; depth 3.5 to 4.1; D. X-12; A. 10; scales 93 to 105.

Body elongate, little compressed anteriorly; head moderately short, somewhat broader than deep at nape; snout broader than long, 2.1 to 2.28 in head; eye 4.8 to 6.75; interorbital moderately concave, 3.55 to 4.15; mouth broad; maxillary scarcely reaching anterior margin of eye, except in young, 2.05 to 2.25 in head; vomerine teeth in one continuous band, the band not interrupted on median line; a prominent ridge from margin of snout to preopercular spine, serrate on snout and with 4 flat spines on side of head behind serrations, these spines, as well as all the others on the head, proportionately much larger in the young than in the adult; supraorbital elevated, bearing 2 spines, one over the anterior and one over the posterior part of eye, each close to the orbital rim and without accessary spine at base; ridges and granules moderately coarse; gill-rakers rather slender, only 5 or 6 developed on the lower limb of anterior arch; scales small, thin, feebly ctenoid, not rough to the touch, wanting on anterior part of breast and usually along base of ventrals, those present being more or less embedded; spinous dorsal moderately elevated, its origin slightly in advance of margin of opercle, the second or third spine longest, a little longer than the longest soft rays, but scarcely as long as snout, the posterior spine or tubercle very short, caudal fin slightly concave, the upper rays longest; anal fin similar to soft dorsal, its origin a little behind origin of the latter; ventral fins moderate, failing to reach vent, except in young, inserted a little behind base of lower rays of pectorals; pectoral fins short, reaching about opposite vent, 3.1 to 3.7 in body.

Color in alcohol dusky brown above, pale below; an obscure broad dark bar extending downward from anterior part of spinous dorsal, a second and more distinct one from posterior part of soft dorsal; a dusky shade on cheek, extending downward to behind tip of maxillary; spinous dorsal, anteriorly at least, dusky; soft dorsal pale, with dark margin on membranes and usually with faint dark spots; caudal fin with large black spots, the distal portion of the membranes black; anal fin white; ventral fins colorless, or a little dusky at tips; pectoral fins dusky or black, with large pale blotch on distal third of the median connected rays; body almost wholly brick-red in life.

We preserved 14 specimens, ranging in length from 146 to 235 mm. This species is rather common and it is frequently seen in the market. Its commercial value, however, is small.

Recorded from the Gulf of Fonseca and Panama Bay. Our specimens were partly bought in the Panama City market and partly taken by the use of dynamite along the rocky shores of the small islands near Balboa.

616. Prionotus xenisma Jordan & Bollman.

Prionotus xenisma Jordan & Bollman, Proc. U. S. Nat. Mus., 1889, 169 (Albatross Stations, 2795 and 2805, in Panama Bay, 33 and 51½ fathoms); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2154; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 162.

Head 2.5 to 2.65; depth 3.35 to 3.5; D. VII-11; A. 10; scales 60 to 70; pores 35 to 40.

Body short and robust, little compressed; head short and high; snout short and broad, its breadth greater than its length, its anterior margin deeply emarginate, its length 2.65 in head; eye 4; interorbital narrow, deeply concave, 6 to 6.5 in head; mouth small; maxillary not reaching front of eye, 3 to 3.35 in head; band of palatine teeth rather broad; orbital rim elevated, its edges granular, serrate; no distinct preorbital spine; a groove across top of head behind the blunt supraorbital spine; occipital ridges present, the outer granular and not spinous, the inner elevated into a short spine; temporal region with a roughish ridge with two bluntish prominences; no spines on suborbital; preopercular spine large and strong, with a smaller spine at its base; opercular spine long and sharp; humeral spine usually larger than opercular; gill-rakers short and slender, about equal to .6 of pupil; scales rather small, about equal in size on breast and belly, extending beyond base of pectorals, forming an obtuse angle anteriorly on breast; spinous dorsal high, the first spine longest, 1.75 to 1.8 in head; the anterior margin of the first three spines with numerous granules; longest ray of second dorsal shorter than snout, 3.15 in head; caudal slightly lunate, 1.75 in head; longest anal ray 3.65 in head; ventrals reaching anal; pectorals quite short, reaching fifth ray of second dorsal, 3 in body.

Coloration in spirits grayish (probably red in life); dusky above and irregularly mottled; a distinct dark spot before base of caudal; dorsal dusky, with a large, black, ocellated spot between fourth and fifth spines; dorsal spines with a row of dark spots on their anterior margin; soft dorsal with 3 rows of dark spots; caudal barred with dusky; anal and ventrals pale; pectorals blackish, a few of the upper rays pale on the inner side.

This species was not seen by us. The above description was compiled from published accounts. It probably does not frequent the shallow water of the shores.

Known only from Panama Bay where many specimens were dredged by the Albatross in 33 and 51½ fathoms at Stations 2795 and 2805.

617. Prionotus loxias Jordan.

Prionotus birostratus Jordan & Bollman, Proc. U. S. Nat. Mus., 1889, 170 (not of Richardson).

Prionotus loxias Jordan, in Gilbert, Proc. U. S. Nat. Mus., 1896, 452 (Albatross Station 2805, Panama Bay, 51½ fathoms); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2155; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 162.

Head 2.5; depth 3.5; D. X-10 or 11; A. 10; scales about 50.

Body stout; head large, rough; snout broad, slightly emarginate at tip, 2.5 in head; eye 3.75 to 4 in head; interorbital narrow, its ridge evenly concave, 2.65 in eye; mouth moderate; maxillary not reaching front of orbit, 2.65 in head; teeth in bands on jaws, vomer, and palatines; supraorbital ridge prominent, with a bluntish spine before and behind; occipital ridges a short distance behind supraorbital ones, ending in a bluntish spine as also the nuchal ridges; preorbital edge prominent, finely denticulated; a transverse groove on head behind eye; no spine at center of radiation of cheek; preopercular spine without smaller one in front; opercular spine strong, nearly as large as preopercular spine; humeral spine small, not half as large as either of the others; gill-rakers short, about 10 below angle; breast closely scaled; first dorsal spine longest, serrate in front, 1.8 in head; first dorsal ray slightly serrulate at base, 3 in head; caudal lunate, with pointed lobes, 1.75 in head; longest anal ray 4 in head; ventrals long, almost reaching tips of pectorals; pectorals short, scarcely longer than longest detached ray, 3.5 in body.

Color brownish above, grayish below; head and anterior parts more or less distinctly vermiculated with dark olivaceous, these markings especially distinct on bones of head; sides with 6 to 15 narrow oblique bands extending downward and backward about half way to anal fin, these obsolete or less conspicuous on anterior portion of body; both dorsals mottled with olive; caudal with 3 broad blackish bars, not crossing the upper and lower ray, the last bar broad and very conspicuous; no black spot at base of caudal; anal and ventrals white; pectorals blackish, faintly barred and margined with white.

This species was not seen by us. The above description was compiled from published accounts.

Known only from the types dredged in Panama Bay by the Albatross at Station 2805 in 51½ fathoms.

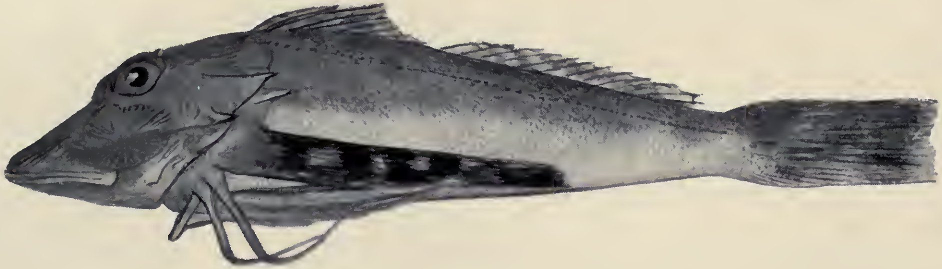
618. Prionotus aspersus sp. nov. (Plate LXXXIII.)

Type No. 81613, U. S. N. M.; length 135 mm.; Mindi Cut, Canal Zone.

Head 2.5 to 2.7; depth 4.1 to 5.7; D. X-12; A. 11; scales 95 to 100; pores 50 to 54.

Body elongate, the width and depth equal at origin of dorsal; head moderate, depressed below; snout rather broad, emarginate, 2.1 to 2.3 in head; eye 4.95 to 5.7; interorbital rather deeply concave, 7.5 to 9 in head; mouth large, horizontal, the gape nearly as broad as long; maxillary reaching nearly or quite to anterior margin of eye, 2.35 to 2.6 in head; teeth villiform, in bands on jaws, vomer and palatines; the bands on jaws somewhat broader than those on palatines; supraorbital raised, with a prominent spine posteriorly; preocular margin serrate, the uppermost spines enlarged; suborbital stay without a spine at center of radiation on cheek, ending in a prominent spine on preopercular margin, with a smaller spine at its base; opercle with a single strong keeled spine; a strong spine on shoulder girdle above base of pectoral; occipital region with 3 spines on each side and no cross-groove; gill-rakers slender, the longest scarcely half as long as eye, about 8 more or less developed on lower limb of first arch; pseudobranchiæ well developed; scales rather small, none on head, those on chest more or less embedded; lateral line prominent, without modified scales; dorsal fins separate; the origin of first dorsal over base of upper rays of pectorals, the spines rather high, the first shorter than the second, scarcely serrulate in front, the second spine about 2 in head, higher than the longest soft rays; caudal fin moderate, the margin straight or slightly truncate; anal fin similar to second dorsal and opposite it; ventral fins moderate, inserted under base of pectorals; pectoral fins with 3 free slender tapering rays, the connected rays the longest, reaching past middle of base of dorsal, 2.2 to 2.4 in body.

Color of fresh specimens olive-green above, reddish below; sides of body with brownish red spots, forming indistinct bars; a reddish band on lip, extending backward over branchiostegals; mouth red within; pectorals bright blue; anal fin red; ventrals reddish yellow. Color of the back in alcohol brownish; lower parts pale; indistinct and irregular dark spots on sides; a dusky spot behind end of maxillary; membranes of spinous dorsal dusky; the rays of soft dorsal and



PRIONOTUS ASPERSUS sp. nov.
From the type 135 mm. in length.

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caudal with dusky spots, forming cross-bars; anal, ventrals and free rays of pectorals colorless or slightly dusky; pectoral fins in some specimens wholly black, in others with a few indefinite pale spots, the upper ray and the tips sometimes white.

Six specimens, ranging in length from 113 to 140 mm., were taken. The species inhabits shallow water with muddy bottom. It is perhaps more closely related to *P. evolans* (Linnæus) than any other known form, from which it, however, differs in several respects, viz., shorter snout, narrower interorbital, fewer gill-rakers and in color.

Our specimens are from Mindi Cut, Colon and Porto Bello.

619. **Prionotus quiescens** Jordan & Bollman.

Prionotus quiescens Jordan & Bollman, Proc. U. S. Nat. Mus., 1889, 166 (Albatross Stations 2800, 2801, 2802, and 2805, in Panama Bay, 7 to 51½ fathoms); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2161; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 162.

Head 2.5 to 2.75; depth 4 to 4.5; D. X-12; A. 11; scales in lateral line 50 to 55, in a longitudinal series 60 to 70.

Body rather slender, compressed; head moderately elongate, not elevated; snout broad, of about equal length and breadth, anterior margin emarginate, 2.5 to 2.65 in head; eye 4.65 to 5; interorbital not deeply concave, rather wide, 4.65 to 5 in head; mouth rather large; maxillary reaching slightly beyond anterior margin of orbit, 2.5 in head; band of palatine teeth narrow; orbital rim not especially elevated, its edges granulated, especially anteriorly; preorbital and postorbital spines small and blunt; no groove across head behind orbits; occipital ridges present, inner very low, ending in a very small spine; outer ridge large, ending in a moderate spine; temporal region with a slightly elevated roughish ridge but no spine; no spine on suborbital stay; preopercular spine long and sharp, its anterior edge somewhat serrulate, no smaller spine below it; opercular and humeral spines sharp, well developed; only 3 distinct spines on each side of the head, occipital, opercular and preopercular; gill-rakers long and slender, about equal to ½ diameter of eye, 8 to 10 well developed; scales quite small, those on breast between ventrals larger than those on belly and throat; scales extending beyong base of pectorals to isthmus; spinous dorsal rather low, the first spine not strongly serrulate, ¾ length of second, the latter 2.5 in head; first ray of second dorsal weakly serrulate at base; longest ray shorter than snout and slightly less than 3 in head; caudal lunate, 1.5 to 1.65 in head; longest anal ray 3.5 in head; ventrals reaching vent; pectorals reaching last dorsal ray, 2 in body.

Coloration in spirits grayish, unspotted, more dusky above than below; spinous dorsal dusky, a distinct black spot between fifth and sixth spines; soft dorsal with 3 rows of diffuse spots; caudal dusky on outer portion and at base; ventrals and anals pale; pectorals mostly black, with faint pale cloudings; body largely red in life.

This species was not seen by us. The above description was compiled from published accounts.

Known from the Gulf of California to Panama Bay. The "types" were dredged by the Albatross in Panama Bay in depths of 7 to 51½ fathoms.

620. **Prionotus albirostris** Jordan & Bollman.

Prionotus albirostris Jordan & Bollman, Proc. U. S. Nat. Mus., 1889, 168 (Albatross Station 2795, Panama Bay, 33 fathoms); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2163; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 162.

Head 3; depth 4.5; D. X-12; A. 11; pores in lateral line 50 to 55.

Body moderately elongate, little compressed; head rather short and high; snout broad, its breadth at angle of mouth almost equal to its length, 2.3 in head, its anterior margin not produced but slightly emarginate; eye 4.5 in head; interorbital space narrow, deeply concave, smoother than rest of head, its width 6.5 in head; mouth moderate; maxillary not reaching front of eye, 2.75 in head; band of palatine teeth rather broad; orbital rim elevated, with coarse spine-like striæ in front, inner largest stria forming the preopercular spine; upper margin of eye with strong serræ ending behind in a large supraocular spine; suborbital stay with an elevated serrulate ridge, but no spine; occipital ridges strong, the inner pair with a few points at base, ending in a compressed spine, the outer with strong serræ at base, and extending to opposite first dorsal spine; temporal ridge slightly crenulate, with 2 blunt spines; no groove across head behind eyes; preopercular spine without a smaller one at base, but with a sharp ridge before it, edge serrulate; opercular spine small and blunt, smaller than the strong humeral spine; gill-rakers rather short, the longest less than ⅓ eye, 5 most strongly developed; scales strong, smaller on belly than on breast, not extending before a line drawn between base of pectorals and ventrals; spinous dorsal moderately high, the first spine very strongly serrulate in front, shorter than the second, the latter 2 in head; first ray of second dorsal serrulate at base, the longest ray very slightly longer than snout; longest anal ray 3 in head; caudal subtruncate, 1.3 in head; ventrals reaching third anal ray; pectorals long, reaching to the last dorsal ray or farther in young, 1.9 in body.

Color in spirits grayish, unspotted, darkest above and with darker cross shades; snout and jaws white; the tip of each jaw, a bar across each jaw, and one behind angle of mouth black; a black bar on anterior and another on posterior part of interorbital, the latter extending across cheek; first dorsal dusky, vaguely clouded with darker; second irregularly spotted, its posterior half dusky; caudal broadly black at base and tip, its middle part yellowish; pectorals dark, with a slight violet shade and traces of darker mottlings; middle of anal dusky; ventrals dusky on upper surface.

This species was not seen by us. The above description is taken from published accounts.

Known from the Gulf of California to Panama Bay. The "types" were dredged in Panama Bay by the Albatross at Station 2795, in 33 fathoms.

Family LXXIII. Cephalacanthidæ.

THE FLYING GURNARDS.

Body elongate, rather broad; sides rather vertical; head blunt, quadrangular, nearly the entire surface bony; the bones about the eye united into a shield; a long bony process ending in a sharp spine, extending backward from nape to or beyond origin of dorsal; preorbital projecting beyond the jaws; preopercle extending backward as a long round spine, reaching beyond the base of ventrals; mouth small, inferior; teeth granular, present only on the jaws; gill-openings restricted to the sides; pseudobranchiæ large; scales small, keeled; dorsal fin consisting of slender spines and rays; pectoral fins greatly enlarged, divided into 2 sections, the inner section much the longer. This family contains 4 or 5 genera, with a single representative in American waters.

220. Genus **Cephalacanthus** Lacépède.

Cephalacanthus Lacépède, Hist. Nat. Poiss., III, 1802, 323 (type *Gasterosteus spinarella* Linnæus).

Dactylopterus Lacépède, Hist. Nat. Poiss., III, 1802, 325 (type *Dactylopterus pirapeda* Lacépède = *Trigla volitans* Linnæus).

Cephacandia Rafinesque, Analyse. Nat., etc., 1815, 85 (substitute for *Cephalacanthus* Lacépède).

Gonocephalus Gronow, Cat. Fish, 1854, 105 (type *Gonocephalus macrocephalus* Gronow = *Trigla volitans* Linnæus).

The characters of the genus are included in the description of the family. The flying gurnards possess the power of flight, but to a much less degree than the true flying fishes.

621. Cephalacanthus volitans (Linnæus).

Trigla volitans Linnæus, Syst. Nat., Ed. X, I, 1758, 302 (after Artedi, "Mari Mediterraneo, Oceano, Pelago inter tropicos, in Asia, imprimis, ad Cap. b. Spei, saepe agitata evolans ex aqua.").

Trigla tentabunda Walbaum, Artedi Piscium, Pt. III, 1792, 362.

Dactylopterus pirapeda Lacépède, Hist. Nat. Poiss., III, 1802, 326 (Mediterranean and almost all warm seas).

Callionymus pelagicus Rafinesque, Amer. Monthly Mag., II, Jan., 1818, 205 (Atlantic Ocean).

Dactylopterus volitans Cuvier & Valenciennes, Hist. Nat. Poiss., IV, 1829, 117; Fowler, Proc. Ac. Nat. Sci. Phila., 1917, 136 (Colon).

Gonocephalus macrocephalus Gronow, Cat. Fish, 1854, 106 (Pelagic).

Cephalacanthus volitans Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2183, Pl. CCCXXIII, fig. 778.

Head 3.65 to 3.9; depth 5.25 to 5.5; D. II-IV-8; A. 6; scales from upper angle of gill-opening to base of caudal 56 to 60.

Body elongate, somewhat depressed; head low, quadrate; snout blunt, 2.55 to 3 in head; eye 2.7 to 3.2; interorbital broad, deeply concave, 1.45 to 1.95 in head; mouth inferior, horizontal; maxillary reaching anterior margin of pupil, 2.75 to 3.1 in head; teeth blunt, 2 triangular patches on upper jaw, 2 more elongate patches on lower jaw, patches on each jaw well separated at symphysis; gill-openings restricted to the sides; preopercular spine reaching base of pectoral but shorter than occipital spine; no lateral line; scales moderate, with prominent ridges; dorsal fin in 3 parts, the first consisting of 2 slender free spines, the second consisting of 4 connected spines, decreasing rapidly in length posteriorly, the third consisting of 8 soft rays; caudal fin deeply concave; anal fin of soft rays only, its origin a little behind that of the soft dorsal; ventral fins slender, inserted under posterior part of base of pectorals, the longest ray about equal to length of head; pectoral fins very long, reaching to or beyond base of caudal, 1.2 to 1.35 in body.

Color of a fresh specimen dark brown above, the scales with yellow margins; yellowish below; dorsal, caudal, anal and ventrals mostly yellow; pectorals dark brown, with deep blue spots near outer margin, the margin itself blue, the tips of rays yellow; the short detached rays of pectorals yellowish, with 5 or 6 blue cross-bars; the fin largely deep-blue underneath; the rays of soft dorsal and caudal with dark spots.

This species is represented by 5 specimens, ranging in length from 110 to 210 mm.

Known from both coasts of the Atlantic Ocean, straying north as far as Woods Hole, Massachusetts. Our specimens are from Colon and Porto Bello.

Family LXXIV. Gobiidæ.

THE GOBIES.

Body elongate; mouth various, moderate or large; premaxillaries protractile; skin of head continuous with covering of eyes; eyes large or small, some species blind; opercle unarmed; preopercle unarmed or with a single spine; pseudobranchiæ present; gills 4; gill-membranes united to the isthmus; lateral line absent; scales present or wanting; air bladder usually wanting; dorsal fins 2, separate or united, the spinous part least developed; anal similar to soft dorsal; caudal rounded or pointed, not concave or forked; ventral fins thoracic, either close together or united so as to form a sucking disk; pectorals large or small.

This is a large family, consisting for the most part of small carnivorous shore fishes, found in the warmer waters of all parts of the world. Only a few of the species reach sufficient size to be of commercial importance. Great difficulty was experienced in the arrangement of the genera. The fresh water species of this family occurring in Panama waters have been discussed by us in an earlier paper (Field Mus. Nat. Hist. Pub., Zoöl. Ser., X, 1916, pp. 349 to 370). The salt water species on the coasts of Panama are all small and of no value as food.

KEY TO THE GENERA.

a. Ventral fins separate.

b. Anterior half of body naked; caudal fin without procurrent rays; preopercle probably without spine at angle. *Gymneleotris*, p. 863.

bb. Anterior half of body for the most part scaly; caudal fin with many procurrent rays at base; preopercle with a concealed hook at angle. *Erotelis*, p. 864.

aa. Ventral fins united, forming a sucking disk.

c. A prominent dermal crest extending from interorbital area to origin of dorsal; pectorals without free silk-like rays. *Lophogobius,* p. 866.

cc. Dermal crest wanting.

d. Tongue anteriorly with an evident notch; pectoral fins with free silk-like rays above. *Bathygobius,* p. 867.

dd. Tongue not notched; pectoral fins without free silk-like rays.

e. Teeth in both jaws in a single series.

f. Teeth in a wide-set series; dorsal fin single, continuous; the dorsal and anal more or less joined to the caudal. *Tyntlastes,* p. 869.

ff. Teeth in a single series, more or less compressed, incisor-like or notched at the tips; dorsal fins separate; the soft dorsal and anal not joined to the caudal. *Evorthodus,* p. 869.

ee. Teeth in the lower jaw in 2 or more series or in a band, never in a single series; those of the upper jaws various, in a single or few series or in a band.

g. Teeth in upper jaw in 1 or 2 series; those in the lower jaw in 2 or more series or in a band.

h. Teeth in both jaws in 2 series; first dorsal with 7 or 8 spines. *Microgobius,* p. 871.

hh. Teeth in upper jaw in a single series, those in the lower jaw in a narrow band; dorsal with 6 spines. *Euctenogobius,* p. 874.

gg. Teeth in both jaws in several series or in bands.

i. Dorsal fins separate; soft dorsal and anal not joined to the caudal.

j. Teeth in the jaws in narrow bands, the outer series in upper jaw usually well separated from the others by an interspace; scales posteriorly ctenoid, usually wanting on head; dorsal spines 6, rarely 7. *Gobionellus,* p. 876.

jj. Teeth in the jaws in several series or in a band, the outer series in upper jaw not conspicuously separated from the others by an interspace; dorsal spines either 4 or 7, rarely 6.

k. Shoulder girdle without dermal flaps; first dorsal usually with 7 spines.

l. Scales large, ctenoid, present on entire body, present or wanting on head.

m. Scales present on top of head, cheeks, and opercles; soft dorsal and anal each with about 15 rays; dorsal spines filamentous. *Bollmannia,* p. 885.

mm. Scales wanting on head; soft dorsal and anal each with 10 or 12 rays; dorsal spines short, not filamentous. *Aboma,* p. 887.

ll. Scales small or wanting; occurring only on posterior part of body, if present.

n. Four barbels present about the mouth; both pairs of nostrils ending in a short tube.

o. Body scaled posteriorly. *Enypnias,* p. 887.

oo. Body entirely naked. *Gerhardinus* gen. nov., p. 889.

nn. No barbels about the mouth; nostrils not ending in a tube.

p. Scales present on posterior part of body; mouth oblique. *Garmannia,* p. 889.

pp. Scales entirely wanting; mouth horizontal. *Gobiosoma,* p. 891.

kk. Shoulder girdle with rather long, flexible dermal flaps; dorsal spines 4; scales very small, not evident except under magnification. *Evermannia,* p. 891.

ii. Dorsal fins continuous; the soft dorsal and anal each with 16 to 22 rays, joined to the base of the caudal. *Gobioides,* p. 894.

221. Genus **Gymneleotris** Bleeker.

Gymneleotris Bleeker, Arch. Néerl. Sci. Nat., IX, 1874, 304 (type *Eleotris seminudus* Günther).

"Body scaled only posteriorly, the anterior half and the head naked. Ventrals separate, I, 5. Vomer without teeth. Isthmus broad; skull without crests. Lower jaw with 4 large recurved teeth. Otherwise essentially as in *Eleotris,* the preopercle probably without spine." (Jordan & Evermann.)

622. Gymneleotris seminudus (Günther).

Eleotris seminudus Günther, Proc. Zoöl. Soc. London, 1864, 24, Pl. IV, figs. 2 & 2a (Panama).

Gymneleotris seminudus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2204; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 170; Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 146 (Acapulco, Mex.).

"Head 3½. D. VII-11; A. 9. Head depressed, broader than high, flat above. Snout rather obtuse, longer than eye, lower jaw somewhat prominent; cleft of mouth extending to below anterior margin of orbit. Teeth in upper jaw in a narrow band, the lower having 4 somewhat larger and recurved teeth in front, appearing to form a single series; palate toothless. None of the fin rays prolonged; pectoral not quite extending to origin of second dorsal; ventral much shorter than pectoral, its inner ray the longest, the others gradually decreasing in length outward; caudal fin rounded. Head and trunk naked; tail covered with small scales. Brown, with numerous well defined white cross-stripes on head as well as on body; vertical fins black."

This species is known from the type, a specimen about 45 mm. in length, taken at Panama, and from a specimen about 33 mm. in length from Acapulco, Mexico.

The above description is copied from Jordan & Evermann (Bull. U. S. Nat. Mus., XLVII, 1898, p. 2204).

222. Genus **Erotelis** Poey.

Erotelis Poey, Memorias, II, 1861, 272 (type *Erotelis valenciennesi* Poey = *Eleotris smaragdus* Cuvier & Valenciennes).

Alexurus Jordan, Proc. Cal. Ac. Sci., 2nd Ser., V, 1895, 511 (type *Alexurus armiger* Jordan).

Body elongate; preopercle with a broad concealed hooked spine at its angle; scales small, cycloid; caudal fin broad, with many procurrent rays at base; ventral fins separate. Two apparently closely related species are known.

KEY TO THE SPECIES.

a. Second dorsal with 13 rays; anal 11; maxillary reaching below middle of eye. *armiger,* p. 864.

aa. Second dorsal with 11 rays; anal 10; maxillary reaching anterior margin of eye. *smaragdus,* p. 865.

623. **Erotelis armiger** (Jordan).

Alexurus armiger Jordan, Proc. Cal. Ac. Sci., 2nd Ser., V, 1895, 511, Pl. LXVIII (La Paz, Lower California); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2203; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 170 (Panama Bay).

Head 3.9; depth 7.3; D. VI-13; A. II, 9; scales about 102.

Body long and low, compressed posteriorly, depressed anteriorly; head broad and flat; snout short, 6.5 in head; eye small, high up, 8 in head; mouth moderate, very oblique, the lower jaw heavy, projecting; maxillary reaching middle of eye, 3.25 in head; teeth in the jaws in broad villiform bands, the outer one in each jaw enlarged, those in the upper jaw increasing in size laterally, those in the lower jaw present only anteriorly; preopercle with a concealed hook at its angle; gill-membranes rather narrowly attached to the isthmus; scales small, cycloid; top of head, cheeks and opercle with very small scales, some of them partly embedded; first dorsal rays low, slightly filamentous; second dorsal low, its last ray longest; caudal long, bluntly pointed, with strongly procurrent rays both above and below; anal fin similar to second dorsal; ventral fins short, inserted under base of pectorals; pectoral fins short, 1.3 in head.

Color brownish, dusky above, paler below, but everywhere covered with fine black dots; both dorsals with pale membranes, the rays barred with black; caudal dusky brown; anal, ventrals and pectorals speckled, the pectorals with dusky base.

This species is represented by a single specimen, 63 mm. long, sent by Mr. Robert Tweedlie. This appears to be the second specimen taken on the coast of Panama. The previous Panama record was based on a specimen secured in 1896 by Prof. C. H. Gilbert and associates.

Known from Lower California to Panama. The specimen at hand was taken at Chame Point.

624. **Erotelis smaragdus** (Cuvier & Valenciennes).

Eleotris smaragdus Cuvier & Valenciennes, Hist. Nat. Poiss., XII, 1837, 231 (Cuba).

Erotelis valenciennesi Poey, Memorias, II, 1861, 273 (Cuba).

Erotelis smaragdus Jordan & Eigenmann, Proc. U. S. Nat. Mus., 1886, 484; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2204, Pl. CCCXXV, fig. 785; Starks, Leland Stanford Jr. Univ. Pub., Univ. Ser., 1913, 66 (Natal, Brazil).

Head 4.3 to 5.5; depth 8 to 12; D. VI-11; A. 10; scales 100.

Body very long and slender, compressed posteriorly; head depressed, flat above; eyes mostly superior; interorbital area more than 2 times as wide as eye, with a knob near its middle; mouth very oblique, the lower jaw much projecting; maxillary reaching anterior margin of eye; teeth small, in bands; scales very small, cycloid; dorsal spines lower than the rays of second dorsal; second dorsal rather high, the longest rays 1.2 in head; caudal fin lanceolate, longer than head; ventral fins separate, 2 in head.

Color very dark green, almost black, with some dark markings about the eye; fins mostly bluish, the dorsal with brown lines, the pectoral with dark markings on base.

This species was not taken on the Panama coast, but its range places it within the scope of the present work.

According to Starks (Leland Stanford Jr. Univ. Pub., Univ. Ser., 1913, p. 66) this species and *E. armiger* from the Pacific coast are closely related, if not in fact identical. We have not seen specimens of *E.*

smaragdus and our description has been compiled from published accounts.

Known from Florida to Brazil.

223. Genus **Lophogobius** Gill.

Lophogobius Gill, Proc. Ac. Nat. Sci. Phila., 1862, 240 (type *Gobius cristagalli* Cuvier & Valenciennes = *Gobius cyprinoides* Pallas).

Body short, rather deep, compressed; teeth in the jaws in bands; scales large; a prominent fleshy median crest, extending from interorbital area to origin of dorsal; dorsal fins distinct, the anterior with slender filamentous spines; caudal fin rounded; ventral fins fully united, forming a sucking disk, free from abdomen.

625. Lophogobius cyprinoides (Pallas).

Gobius cyprinoides Pallas, Spicil. Zool., I, Fasc. 8, 1770, 17, Pl. I, fig. 5 ("Amboina"; probably from the West Indies).

Gobius crista galli Cuvier & Valenciennes, Hist. Nat. Poiss., XII, 1837, 130 (Havana).

Lophogobius cyprinoides Poey, Repertorio, II, 1868, 393; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2209, Pl. CCCXXVI, fig. 786.

Head 3; depth 2.88; D. VI-10; A. 9; scales 27.

Body rather robust, short, compressed; the back elevated; head short, rather broad; snout short, bluntish, 4.45 in head; eye large, 3.35 in head; interorbital scarcely half as wide as eye; mouth oblique; the lower jaw slightly projecting; maxillary reaching vertical from anterior margin of pupil, 2.68 in head; teeth in the jaws in broad villiform bands, the outer series in each jaw somewhat enlarged; opercle and preopercle unarmed; gill-openings restricted to the sides, broader than base of pectorals, the membranes attached to the isthmus, forming a fold across it; scales large, ctenoid, wanting on head and on median line of nape; a prominent fleshy crest extending from interorbital to origin of dorsal; dorsal fins separate, the first one with slender filamentous spines, the median ones longest, shorter than head; second dorsal rather high, the last rays reaching slightly past base of caudal; caudal fin rounded, about as long as head; anal fin similar to second dorsal; ventral fins fully united, forming a sucking disk, wholly free from abdomen; pectoral fins large, slightly pointed, the median rays longest, reaching beyond origin of anal, slightly longer than head.

Color in alcohol uniform dark brown, lower parts a little paler; spinous dorsal black; the other fins slightly lighter than the body.

We have a single, poorly preserved specimen, 48 mm. in length, upon which we base the foregoing description. Our specimen appears to be deeper, with a more strongly elevated back, than Cuban specimens with which we compared it. Fin and scale counts, however, agree perfectly.

Previously recorded from Florida and the West Indies. Our specimen was taken at Porto Bello.

224. Genus **Bathygobius** Bleeker.

Bathygobius Bleeker, Arch. Néerl. Sci. Nat., XIII, 1878, 54 (type *Gobius nebulopunctatus* Cuvier & Valenciennes).

Mapo Smitt, Öfv. K. Vet.-Ak. Förh., 1899, 551 (type *Gobius soporator* Cuvier & Valenciennes).

Body moderately elongate; head rather broad, depressed; the skull with a low median crest; snout bluntly rounded; eyes large, close together; opercle unarmed; mouth moderate, nearly horizontal; teeth in the jaws conical, in bands, no canines; tongue with a distinct notch anteriorly; scales moderate, ctenoid, wanting on cheeks and opercles; dorsal fins 2, the first with 6 or rarely with 7 spines; caudal fin rounded, not produced; ventral fins fully united, free from the abdomen; pectoral fins with free, silk-like rays above.

626. **Bathygobius soporator** (Cuvier & Valenciennes).

Gobius soporator Cuvier & Valenciennes, Hist. Nat. Poiss., XII, 1837, 56 (Martinique); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2216; Boulenger, Boll. Mus. Zoöl. Anat. Torino, XIV, No. 346, 1899, 3 (Rio Tuyra, Darien; Flamenco Island, Panama Bay); Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 171 (Panama Bay); Breder, Zoologica, IV, Pt. 4, 1925, 157 (Caledonia Bay).

Gobius catulus Girard, Proc. Ac. Nat. Sci. Phila., 1858, 169 (St. Joseph Island, Texas).

Gobius mapo Poey, Memorias, II, 1861, 277 (Cuba).

Gobius lacertus Poey, Memorias, II, 1861, 278 (Cuba).

Gobius caroliniensis Gill, Proc. Ac. Nat. Sci. Phila., 1863, 268 (Charleston, S. C.).

Gobius andrei Sauvage, Bull. Soc. Philo. Paris, 7 sér., IV, 1880, 44 (Rio Guayas, Ecuador).

Evorthodus catulus Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1882 (1883), 632.

Gobius arundelii Garman, Proc. N. E. Zoöl. Club, I, 1899, 63 (Clipperton Island).

Mapo fuscus Evermann & Goldsborough, Proc. Biol. Soc. Wash., XXII, 1909, 103 (Taboga Island).

Mapo soporator Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 147 (Perico Island, Panama Bay); Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 405 and 411 (Colon and Panama).

Head 2.95 to 3.45; depth 3.7 to 5.3; D. VI-I, 8 or 9; A. I, 8; scales 35 to 40.

Body elongate, compressed posteriorly; head broader than deep; snout short and blunt, 3 to 4.15 in head; eye 3.5 to 4.9; mouth moderate, terminal, slightly oblique, the gape reaching anterior margin of pupil; teeth in the jaws in broad bands, pointed, the outer ones more or less enlarged; opercle and preopercle without spines or serrations; gill-membranes broadly joined to the isthmus; scales rather large, ctenoid, wanting on head, more or less embedded at nape and on chest and abdomen; dorsal fins well separated, the first with flexible spines, the second longer, the rays all of about equal length; caudal fin round; anal fin similar to second dorsal, but slightly smaller; ventral fins forming a large sucking disk; pectoral fins broad, rounded, the middle rays the longest, the upper rays with free ends, 1.1 to 1.4 in head.

Color various, from plain dark brown to pale or straw color; the pale specimens with dark spots or more or less distinct dark cross-bars; dorsal and caudal with dark spots or cross-bars; anal fin dusky or at least with an intramarginal dark bar and pale margin; ventrals pale or dusky; pectorals pale or slightly dusky at base.

This species is abundant on both coasts of Panama and is represented by numerous specimens, ranging in length from 27 to 145 mm. We are unable to find any difference whatever in the representatives from the opposite coasts, except that the Pacific coast representatives are usually somewhat darker in color. On the other hand we have one lot from the Pacific that is quite as light in color as any from the Atlantic. This fish, although occurring almost everywhere along the coasts, is most abundant on rocky bottom.

Known from all tropical seas. Our specimens from the Atlantic coast are from Toro Point, Colon and Porto Bello. Those from the Pacific coast are from Taboga Island, Chame Point, Naos Island, Balboa, Corozal and Panama City.

225. Genus **Tyntlastes** Günther.

Tyntlastes Günther, Proc. Zoöl. Soc. London, 1862, 194 (type *Amblyopus sagitta* Günther).

Body elongate, compressed; head quadrangular; eye very small or rudimentary; mouth wide, oblique, the lower jaw projecting; teeth in a single series, none on vomer or palatines; dorsal fin single, continuous, with 6 to 8 spines; caudal fin pointed, more or less joined to the dorsal and anal; ventral fins united. A single very rare species is known from the Pacific coast of Panama.

627. Tyntlastes brevis (Günther).

Amblyopus brevis Günther, Proc. Zoöl. Soc. London, 1864, 151 (Panama).

Tyntlastes brevis Jordan & Eigenmann, Proc. U. S. Nat. Mus., 1886, 512; Gilbert, Proc. U. S. Nat. Mus., 1890, 451 (Panama); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2262; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 180.

Head 4.5; depth 8; D. VIII, 14; A. 15.

Body elongate, compressed; teeth long, wide set, in a single series. Caudal fin black.

This fish was not seen by recent investigators. The above brief description is from the meagre accounts of the species which is known only from the type, and from 2 partly digested specimens removed from the stomach of a *Centropomus* which was taken on the Pacific coast of Panama.

226. Genus **Evorthodus** Gill.

Evorthodus Gill, Proc. Ac. Nat. Sci. Phila., 1859, 195 (type *Evorthodus breviceps* Gill).

Body moderately elongate; head short; isthmus moderate or rather broad; teeth in each jaw in a single series, more or less flattened, incisor-like or emarginate; scales moderate, posteriorly ctenoid, becoming smooth anteriorly, present on most of head; first dorsal with 5 or 6 spines; ventral fins united, free from the abdomen.

To this genus we refer the species which agree with the type in having only a single series of teeth in each jaw.

KEY TO THE SPECIES.

a. Teeth deeply notched; the spinous dorsal conspicuously barred with black. *breviceps,* p. 870.

aa. Teeth more or less incisor-like, not notched; the spinous dorsal not barred, with a conspicuous black spot at base and the tips of the longest rays black. *minutus* sp. nov., p. 870.

628. Evorthodus breviceps Gill.

Evorthodus breviceps Gill, Proc. Ac. Nat. Sci. Phila., 1859, 195 (Trinidad); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2208.

Head 4.5; depth 4.5 to 4.75; D. VI-11; A. 12; scales 28 to 30.

Body robust, compressed posteriorly; head thick and short; snout blunt and rounded; eye moderate, 3 in head; mouth horizontal; maxillary reaching below middle of eye; teeth in the jaws small, in a single series, deeply notched at tips; scales ctenoid, of moderate size, those on abdomen small; nape, occiput and opercles scaled; cheeks apparently with a number of embedded scales; dorsal spines not produced, shorter than head; second dorsal and anal similar, the rays about as long as longest dorsal spine; caudal fin slightly acute, a little longer than head; ventral disk moderate, free from the abdomen; pectorals extending slightly beyond ventral disk, but failing to reach vent.

Color in alcohol brown, darkest above; sides irregularly spotted and blotched; the larger blotches of the sides meeting on the back and forming irregular cross-bars; caudal peduncle with a single dark spot; base of caudal with 2 dark spots; spinous dorsal conspicuously barred with black; soft dorsal and caudal barred or checkered with black; anal and ventrals nearly plain translucent; pectoral slightly barred with dusky.

This little goby, which enters fresh water, was not taken by us, but since it comes within the range of the present work it has been here included. The above description is compiled from published accounts of the species.

Recorded from Tampico, Mexico; Trinidad; and Surinam.

629. Evorthodus minutus sp. nov. (Plate LXXXIV.)

Type No. 81847, U. S. N. M.; length 30 mm.; Corozal, Canal Zone.

Head 4; depth 4 to 5; D. V or VI-11 or 12; A. 11 or 12; scales 28 to 30.

Body compressed throughout; head deeper than wide; snout short and very blunt, 4.15 to 6 in head; eye 3 to 3.45; interorbital about .75 width of eye; mouth small, horizontal, terminal or slightly inferior; maxillary reaching slightly past vertical from middle of eye, 3 to 3.25 in head; teeth in the jaws minute, slightly flattened, incisor-like, in a single series in each jaw; gill-openings extending only slightly above base of pectorals; isthmus broad; pores on cheeks very inconspicuous; scales rather large, present on entire body and head except on snout and mandible, ctenoid posteriorly, becoming smooth anteriorly; dorsal fins well separated, the rays all short, none of them as long as head; caudal fin round, equal to length of head; anal fin similar to second dorsal; ventral disk short, failing to reach vent; pectoral fins reaching beyond the tips of ventrals, 1.1 to 1.3 in head.

Color in alcohol brownish above, paler below; sides with irregular dark blotches, forming more or less distinct cross-bars; base of caudal with 2 dark spots, the upper one being most distinct; first dorsal with a round dark spot at base, and with the tips of the longest rays black; second dorsal spotted with dark; caudal fin plain translucent or slightly barred with dusky; anal, ventrals and pectorals pale in spirits. In life the second dorsal and anal are bright red and the side between these fins is dull red.

This fish is represented by 3 specimens, ranging in length from 27 to 30 mm., taken in a muddy tide stream at Corozal.

227. Genus **Microgobius** Poey.

Microgobius Poey, Anal. Soc. Españ. Hist. Nat., V, 1876, 168 (type *Microgobius signatus* Poey).

Zalypnus Jordan & Evermann, Rept. U. S. Fish Comm., XXI, 1895 (1896), 459 (type *Gobius emblematicus* Jordan & Gilbert).

Body more or less compressed; mouth large, very oblique or vertical; teeth rather strong, mostly in 2 series, the outer ones more or less canine-like; no barbels about the mouth; scales of small or moderate size, usually wanting in advance of first dorsal; dorsal spines 7 or 8; with or without a median cutaneous fold in advance of dorsal.

KEY TO THE SPECIES.

a. Scales small, about 70 to 85 in lateral series; a prominent cutaneous fold extending from back of the eyes to origin of first dorsal. *emblematicus*, p. 872.

aa. Scales comparatively large, from 44 to 48 in a lateral series; with or without a slight cutaneous fold in advance of first dorsal.

b. Mouth oblique; maxillary reaching vertical from posterior margin of eye; eye rather small, 3.6 in head. *miraflorensis*, p. 873.

bb. Mouth vertical; maxillary reaching anterior margin of eye; eye large, 3.3 in head. *tabogensis* sp. nov., p. 873.

630. Microgobius emblematicus (Jordan & Gilbert).

Gobius emblematicus Jordan & Gilbert, Bull. U. S. Fish Comm., I, 1881 (1882), 330 (Panama Bay).

Lepidogobius emblematicus Jordan & Eigenmann, Proc. U. S. Nat. Mus., 1886, 505.

Microgobius cyclolepis Gilbert, Proc. U. S. Nat. Mus., 1890, 74 (Albatross Station 3020, Lower California).

Zalypnus emblematicus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2247.

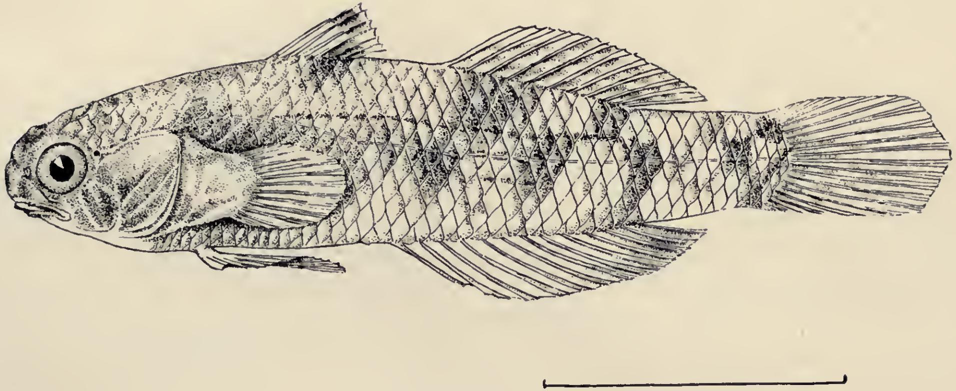
Microgobius emblematicus Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 174 (Panama Bay).

Head 3.6 to 3.8; depth 3.7 to 5.75; D. VII-17 or 18; A. 16 to 18; scales 72 to 83.

Body compressed throughout; head deeper than broad; snout short, 3.55 to 4.7 in head; eye 3.55 to 4.35; interorbital very narrow, not broader than pupil; a prominent cutaneous fold extending from back of eyes to origin of dorsal; mouth large, very oblique, the lower jaw in advance of the upper; maxillary reaching posterior margin of pupil, 1.75 to 2.4 in head; teeth in the jaws mainly in 2 series, the outer series in upper jaw laterally wanting, composed of rather large, strongly recurved teeth, the second series of small villiform teeth; the mandibular teeth like those of the upper jaw, except that the second series laterally is composed of enlarged recurved teeth; scales very thin and small, difficult to enumerate, usually wanting in advance of base of fifth dorsal spine; dorsal fins close together, the median spines sometimes slightly produced, rarely as long as head; second dorsal of about equal height throughout, the posterior rays reaching base of caudal; caudal fin pointed, somewhat longer than head; anal fin similar to second dorsal; ventral disk rather long, usually reaching to vent and occasionally to origin of anal; pectoral fins failing to reach the tip of ventral disk, 1.15 to 1.5 in head.

Color in alcohol pale brown, some individuals with a round dark brown spot on shoulder, above and behind the base of pectorals; fins plain translucent or slightly dusky. Color in life of a specimen 55 mm. in length: Body bright green above to pale green below; head and body in advance of about the fifth ray of second dorsal with alternating streaks and spots of sky-blue and orange; dorsals, caudal and anal pink; anal fin with an orange stripe across base, extending along lower edge of caudal peduncle and on the lower rays of the caudal fin; other fins pale.

This species is represented by 19 specimens, ranging in length from 38 to 65 mm. It is rather common in the tide pools at Panama City.



EVORTHODUS MINUTUS sp. nov.
Drawn from the type 30 mm. in length.

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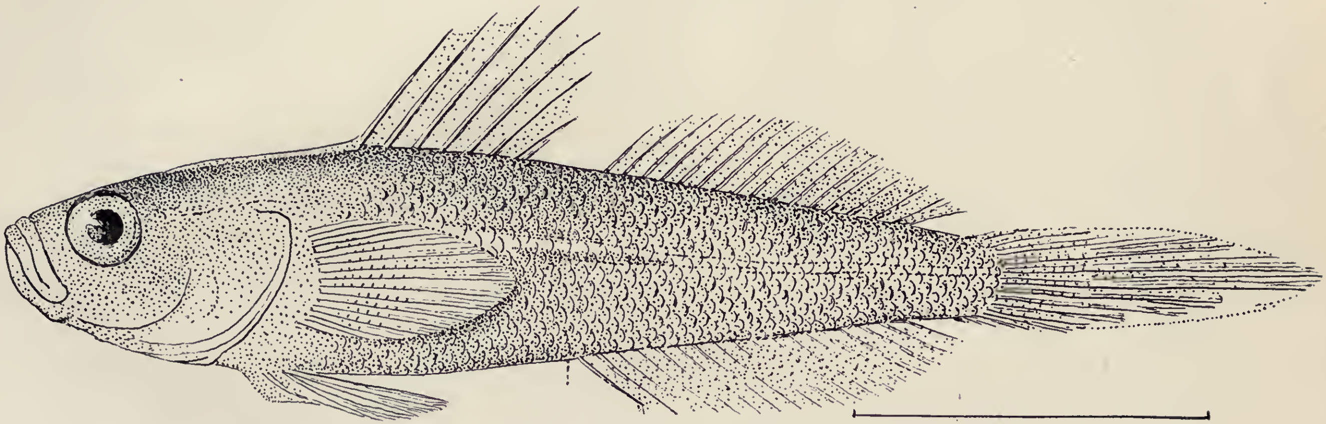

MICROGOBIUS TABOGENSIS sp. nov.
Drawn from the type 45 mm. in length.

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Known only from Lower California and from Panama. Our specimens are from Balboa and Panama City.

631. Microgobius miraflorensis Gilbert & Starks.

Microgobius miraflorensis Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 176, Pl. XXIX, fig. 54 (Pacific coast of Panama); Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 412 (Panama).

Head 3.3 to 3.65; depth 4.25 to 4.85; D. VII-17; A. 17; scales 44 to 49.

Body elongate, rather strongly compressed; head notably deeper than broad; snout short, 4.5 to 4.75 in head; eye 3.6 to 3.7; interorbital not broader than pupil; no cutaneous fold in advance of dorsal; mouth large, quite oblique, the lower jaw projecting; maxillary reaching vertical from posterior margin of eye, 1.75 to 2 in head; teeth in the jaws in 2 series, the outer series in each jaw enlarged, composed of recurved canines and wanting laterally where the second series is somewhat enlarged; scales rather large, ctenoid, wanting in advance of about third dorsal spine and on a narrow strip on median line of abdomen; dorsal spines more or less produced, the median ones filamentous, usually somewhat longer than head; second dorsal lower, of about equal height throughout; caudal fin pointed, notably longer than head; anal fin similar to second dorsal; ventral disk moderate, scarcely reaching vent; pectoral fins reaching slightly beyond tip of ventrals, 1.15 to 1.25 in head.

Color in alcohol light grayish olive; sides with 4 or 5 narrow dark lines, the anterior one broadest and most distinct and situated below the base of the anterior dorsal spines; the outer margin and produced spines of first dorsal dusky; the second dorsal plain translucent, with dusky punctulations, forming more or less distinct longitudinal bands; caudal fin pale, with indefinite V-shaped bars at base; anal fins dusky, or at least with dark margins; ventrals and pectorals plain translucent.

Only 4 specimens of this species, which are all of equal length (45 mm.), were secured. It differs from *M. emblematicus* principally in having much larger scales, in the absence of a cutaneous fold in advance of first dorsal fin, and in color.

This fish is recorded only from the Pacific coast of Panama. Our specimens are from Rio Culebra, tributary of the Rio Bayano, a very muddy and slightly brackish tide stream.

632. Microgobius tabogensis sp. nov. (Plate LXXXV.)

Type No. 81844, U. S. N. M.; length 45 mm.; Taboga Island, Panama.

Head 3.77; depth 4.7; D. VII-17; A. 18; scales about 48.

Body compressed throughout; head much deeper than broad; snout very short, 5 in head; eye 3.33; interorbital about half the width of eye; a slight cutaneous fold from nape to origin of dorsal; mouth moderate, vertical, the lower jaw in advance of the upper; maxillary reaching vertical from anterior margin of pupil, 2.25 in head; teeth in the jaws in two series, the outer series enlarged and wanting laterally where the second series is somewhat enlarged; scales rather large, cycloid, extending forward nearly or quite to base of pectorals, leaving a naked area about base of first dorsal; head and chest naked; abdomen fully scaled; the median dorsal spines somewhat produced, but scarcely as long as head; second dorsal increasing in height posteriorly, the last rays reaching base of caudal; caudal fin pointed, longer than head; anal fin similar to second dorsal; ventral disk short, failing to reach vent; pectoral fins rather long, reaching well beyond the tip of ventrals, nearly or quite to origin of anal, 1.05 in head.

Color in alcohol plain light brown, wholly without spots or bars; fins all plain translucent.

This species is represented by a single specimen, 45 mm. in length, taken at Taboga Island. It differs from *M. miraflorensis* principally in having the mouth vertical, a larger eye, broader interorbital, in the presence of a cutaneous fold in advance of dorsal, smooth scales, and in the more elongate caudal fin. From *M. emblematicus* it may readily be distinguished by the much larger scales and the vertical mouth.

228. Genus **Euctenogobius** Gill.

Euctenogobius Gill, Ann. Lyc. Nat. Hist. N. Y., VII, 1859, 45 (type *Euctenogobius badius* Gill).

This genus, as here understood, differs from *Gobionellus* only in the dentition. The teeth in the upper jaw in a single series; those in the lower jaw in a very narrow band, with the outer series slightly enlarged.

KEY TO THE SPECIES.

a. Scales ctenoid posteriorly, wanting on nape and head, 28 to 35 in lateral series. *panamensis* sp. nov., p. 874.

aa. Scales all cycloid, present on nape, opercles and cheeks, 77 to 87 in lateral series. *liolepis* sp. nov., p. 875.

633. Euctenogobius panamensis sp. nov. (Plate LXXXVI.)

Type No. 81839, U. S. N. M.; length 95 mm.; Rio Culebra, Panama.

Head 3.8 to 4.2; depth 4.65 to 5.45; D. VI-13; A. 13; scales 28 to 35.

Body elongate, compressed throughout; head a little deeper than broad; snout very obtuse, 2.65 to 3.1 in head; eye 3.9 to 4.65; interorbital space about half the width of eye; mouth very nearly horizontal, slightly inferior; maxillary reaching anterior margin of pupil, 2.5 to 2.8 in head; teeth small, in a single series in the upper jaw, in a band in the lower jaw, the outer series enlarged and separated from the very narrow band of minute teeth by an interspace; gill-openings extending well below the base of pectorals; isthmus rather narrow; scales moderate, ctenoid, wanting on nape, head and chest; dorsal fins well separated; the anterior rays of the first dorsal with short filaments; the second dorsal of about equal height throughout, none of the rays much more than half the length of head; caudal fin lanceolate, twice the length of head in adults; anal fin similar to second dorsal; ventral disk short, failing to reach vent; pectoral fins reaching somewhat beyond the ventral disk, 1.1 to 1.3 in head.

Color olivaceous; median line of side with a row of dark blotches, these often more or less elongate and forming short cross-bars; the back with irregular dark markings; the nape occasionally with 2 narrow cross-bars; side of head with 2 longitudinal stripes, one of these just below eye and the other slightly above the angle of the mouth to margin of opercle, these partly or wholly joined by a short oblique bar below eye; dorsals and caudal with a small dark spot, the short filaments of spinous dorsal black; anal fin and ventral disk pale or slightly dusky; pectorals plain translucent, with a large jet-black spot at the base of the upper rays.

This species is represented by 8 specimens, ranging in length from 80 to 115 mm. All were taken in brackish muddy water in the Rio Bayano Basin; seven in the Rio Culebra and one near the mouth of the Rio Mamoni.

634. **Euctenogobius liolepis** sp. nov. (Plate LXXXVII.)

Type No. 81836, U. S. N. M.; length 110 mm.; Beach, Balboa, Canal Zone.

Head 4.85 to 5.25; depth 5.45 to 6.1; D. VI-15; A. 15; scales 77 to 87.

Body elongate, compressed, deeper than broad throughout; head moderate; snout rather short, 3.7 to 4.35 in head; eye 4.8 to 5.35; interorbital not more than half the width of eye; mouth terminal, notably oblique, the lower jaw very weak; maxillary reaching middle of eye, 2.15 to 2.6 in head; teeth small, the upper jaw with a single series, lower jaw with a band of minute teeth; scales small, all cycloid, extending forward nearly to eyes, present also on opercles, cheeks and chest, more or less embedded on the latter two; dorsal fins separate; the first of weak spines; the second dorsal long, its posterior rays the longest; caudal fin pointed, the median rays much longer than the head; anal fin similar to the second dorsal; ventral fins forming a broad sucking disk, free from the abdomen; pectoral fins rather short, reaching little if any beyond the ventral disk, 1.05 to 1.3 in head.

Color olivaceous, the scales above with dusky punctulations, and dark edges; median line of sides with a row of small dark spots; larger dark spots present along the back, forming more or less distinct saddle-like bars posteriorly; dorsals and caudal more or less spotted or barred; other fins plain translucent.

This species is represented by 15 specimens, ranging in length from 80 to 110 mm.; all taken on the same date along a sandy beach near Balboa.

229. Genus **Gobionellus** Girard.

Gobionellus Girard, Proc. Ac. Nat. Sci. Phila., 1858, 168 (type *Gobionellus hastatus* Girard).

Body elongate, rather slender; head moderate, not depressed; teeth in the jaws in narrow bands, the outer series in upper jaw separated from the others by an interspace; scales ctenoid, at least posteriorly, usually wanting on head; dorsal fins 2, the first with 6 or rarely 7 spines; caudal fin lanceolate or rounded; ventral disk free from the abdomen. This genus, as here understood, includes those species which have the teeth in the jaws in villiform bands and the outer series in upper jaw separated from the others by an interspace.

KEY TO THE SPECIES.

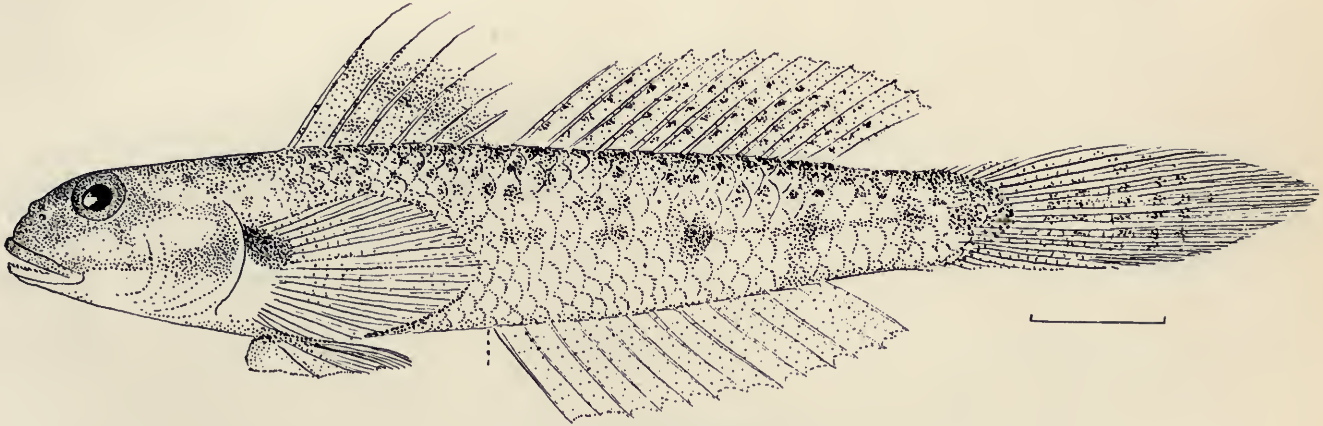
a. Scales small, more than 55 in a lateral series; dorsal and anal each with 13 to 15 rays.

b. Scales very small, 64 to 75 in lateral series; anterior dorsal spines filamentous.

c. Opercle with a patch of scales; color plain grayish brown; a single dark spot below base of spinous dorsal; dorsals and caudal without dark cross-bars. *oceanicus,* p. 877.

cc. Scales wanting on opercle; color light olivaceous; sides with a stripe or dark blotches; a narrow black stripe extending backward from eye; dorsals and caudal faintly barred with black. *microdon,* p. 879.

bb. Scales 58 to 65 in lateral series; teeth in the jaws fixed; none



Euctenogobius panamensis sp. nov.
Drawn from the type 95 mm. in length.

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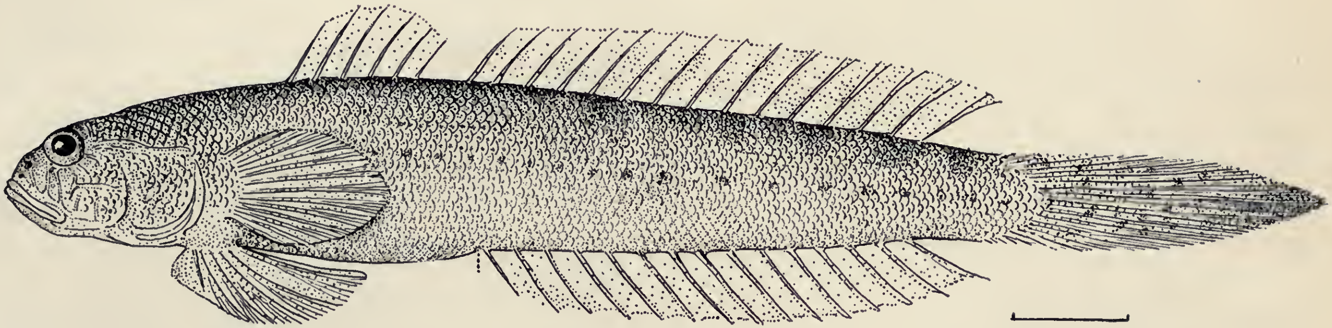

EUCTENOGOBIUS LIOLEPIS sp. nov.
Drawn from the type 110 mm. in length.

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of the dorsal spines filamentous; sides with a series of irregular dark spots; a round spot just behind upper angle of gill-opening; dorsals, caudal and pectorals with dark wavy cross-bars. *sagittula*, p. 879.

aa. Scales larger, usually fewer than 45 in a lateral series; second dorsal and anal each with from 9 to 13 rays.

d. Caudal fin lanceolate, notably longer than head in adult; species of moderate size.

e. Small scales present on nape, chest and abdomen, 29 to 32 in lateral series; anterior spines of first dorsal produced in adult male, reaching nearly or quite to base of caudal; caudal fin translucent, with faint bars in female, darker in male, with a longitudinal white stripe on each lobe. *lyricus*, p. 880.

ee. Scales wanting in advance of first dorsal (not verified in *G. smaragdus*); none of the dorsal spines greatly produced, shorter than head, reaching to or slightly past origin of second dorsal.

f. Scales moderate, 39 to 42 in lateral series; mouth large, slightly oblique, upper jaw slightly projecting; maxillary reaching below pupil or to posterior margin of eye, 2.1 to 2.35 in head. *smaragdus*, p. 882.

ff. Scales large, fewer than 39 in lateral series; mouth moderate, horizontal or slightly oblique; maxillary reaching nearly or quite to middle of eye, 2.5 to 3.15 in head.

g. Head large, 3.5 to 3.9 in length; scales 34 to 38 in lateral series; caudal fin with dark cross-bars in both sexes; pectoral fins plain translucent. *stigmaticus*, p. 882.

gg. Head slightly smaller, 3.95 to 4.3 in length; scales 31 to 35 in lateral series; caudal fin with dark cross-bars in female, the male with a white horizontal stripe on upper and lower half of caudal fin. *manglicola*, p. 883.

dd. Caudal fin rounded or slightly pointed, equal to or shorter than head; species of small size.

h. First dorsal with 6 spines; anal fin with 12 rays; scales 33 to 36 in lateral series. *encæomus*, p. 884.

hh. First dorsal with 7 spines; anal with 9 or 10 rays; scales 27 to 28 in lateral series. *boleosoma*, p. 885.

635. Gobionellus oceanicus (Pallas).

Gobius oceanicus Pallas, Spicil. Zool., I, Fasc. VIII, 1770, 4 (locality unknown; after Gronow); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2230, Pl. CCCXXVII, figs. 789 and 789a.

Gobius lanceolatus Bloch, Oec. Naturg. Fische Deutschl., II, 1783, 8, Pl. XXXVIII, fig. 1 (Martinique; figure probably from Plumier).

Gobius bacalaus Cuvier & Valenciennes, Hist. Nat. Poiss., XII, 1837, 119 (Surinam; Cayenne; Cuba).

Gobionellus oceanicus Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882 (1883), 613.

Head 3.75 to 5.1; depth 5.3 to 7.15; D. VI-14; A. 15; scales 64 to 75.

Body very elongate, compressed; head notably deeper than wide; snout short, blunt, 3 to 4.25 in head; eye placed high, 3.6 to 4.35 in head; interorbital narrower than eye; mouth rather large, terminal, a little oblique; maxillary reaching to or past middle of eye, 1.9 to 2.4 in head; teeth in the jaws movable, in villiform bands, the outer series in upper jaw enlarged and separated from the others by a narrow interspace; opercle and preopercle without spines or serrations; gill-membranes broadly attached to the isthmus; pores present about the head; no lateral line; scales on anterior part of body small, cycloid, more or less embedded, notably larger posteriorly and strongly ctenoid; a patch of scales, apparently varying in size among individuals, present on upper part of opercle; dorsal fins well separated, the spines of the first dorsal filamentous; the second dorsal long, of about equal height throughout; caudal fin long, pointed, the middle rays filamentous, sometimes nearly half the length of rest of body; anal fin similar to second dorsal; ventral fins forming a large sucking disk; pectoral fins without partly detached silky rays, 1 to 1.2 in head.

Color in alcohol grayish brown; opercle with a dark bluish blotch; another dark blotch, equal to or larger than eye, on side under spinous dorsal; sides with a rather faint median dark stripe, often more or less broken up into dark spots; a small caudal spot always present; dorsal fins more or less dusky; anterior spine of first dorsal with from 2 to 4 black spots on anterior margin, or rarely with a continuous black stripe; first ray of second dorsal either with dark spots on anterior margin or with a continuous dark margin; other fins without definite markings, much darker in some specimens than in others; margin of sucking disk pale in specimens having a dark disk; base of tongue with an emerald spot on each side.

This species is represented by more than 100 specimens, ranging in length from 45 to 200 mm. It is very probable that this species and *G. hastatus* are identical.

Known from South Carolina to Texas and the West Indies. Now for the first time recorded from as far south as Panama. Our specimens are from Toro Point, Mindi and Colon.

636. Gobionellus microdon (Gilbert).

Gobius microdon Gilbert, Proc. U. S. Nat. Mus., 1891, 554 (San Juan Lagoon, Mexico); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2227.

Gobionellus microdon Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 171, Pl. XXVIII, fig. 51 (Miraflores, Canal Zone, Panama).

Head 4 to 4.1; depth 4.95 to 5.8; D. VI-13; A. 13 or 14; scales 63 to 72.

Body elongate, compressed throughout, everywhere deeper than broad; head moderate; snout short, 3.34 to 4.25 in head; eye 3.55 to 4.2; interorbital very narrow, scarcely as wide as pupil; mouth terminal, nearly horizontal, the lower jaw very weak; maxillary reaching under middle of eye, 2.3 to 2.5 in head; teeth very small, in a weak band in each jaw; scales extending forward to nape; a naked area on median line of back in advance of first dorsal; sides of head and chest wholly naked; scales on sides behind spinous dorsal strongly ctenoid; dorsal fins separate, the first of weak spines, the anterior spines filamentous, varying in length, but always reaching past the origin of the second dorsal; the second dorsal rather long, of about equal height throughout; caudal fin pointed, the median rays produced, much longer than the head; anal fin similar to the second dorsal; ventral fins forming a rather long narrow sucking disk, free from the abdomen; pectoral fins moderate, reaching opposite vent, 1 to 1.2 in head.

Color light olivaceous; sides with a more or less broken stripe and irregular dark spots; a short dark stripe back of eye and a dark area on opercle; dorsals and caudal slightly barred with black; other fins plain translucent.

This species is represented by 10 specimens, ranging in length from 22 to 60 mm.; all taken in a slightly brackish stream.

Known from San Juan Lagoon, Mexico, south to Pamana. Our specimens are from the Rio Juan Diaz, 6 to 8 miles southeast of Panama City.

637. Gobionellus sagittula (Günther).

Euctenogobius sagittula Günther, Proc. Zoöl. Soc. London, 1861, 371 (West coast of Central America).

Gobius sagittula Jordan & Eigenmann, Proc. U. S. Nat. Mus., 1886, 497; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2228.

Gobius longicaudus Jenkins & Evermann, Proc. U. S. Nat. Mus., 1888, 146 (Guaymas).

Euctenogobius saggitula Boulenger, Boll. Mus. Zoöl. Anat. Torino, XIV, No. 346, 1899, 3 (Rio Cucunati, Darien).

Gobionellus sagittula Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 171.

Head 3.7 to 4.45; depth 5.8 to 8.3; D. VI-13 or 14; A. 14; scales 58 to 65.

Body elongate, compressed posteriorly, anteriorly as wide as deep; head rather short; snout blunt, 3.15 to 3.85 in head; eye small, placed high, 3.85 to 4.75; mouth broad, the upper jaw slightly in advance of the lower; maxillary reaching about middle of eye, 2.7 to 3.15 in head; teeth pointed, in villiform bands, the outer ones in upper jaw somewhat enlarged and well separated from the others; gill-membranes rather broadly connected with the isthmus; scales reduced in advance of dorsal, increasing in size posteriorly where they become strongly ctenoid; dorsal fins well separated, the first with 6 short flexible spines; second dorsal long and of nearly uniform height throughout; caudal fin pointed, about equal to length of head in very young, increasing in proportionate length with age; anal fin similar to second dorsal; ventral fins forming a rather small sucking disk; pectoral fins moderate, more or less pointed, 1.2 to 1.45 in head.

Color in alcohol light yellowish; upper parts with irregular brownish specks or punctulations; median line of sides with 5 irregular dark brown spots; a roundish dark spot on shoulder just above base of pectorals; upper parts of head with small dark spots; side of head with two horizontal dark stripes; dorsals, caudal and pectorals spotted or barred with dark; the other fins colorless.

Twelve specimens of this species, ranging in length from 30 to 90 mm., were taken by us, and Mr. Robert Tweedlie later sent 5 additional specimens. This is a rather rare fish frequenting muddy pools and tide streams.

Known from the Gulf of California south to Ecuador. Our specimens are from Chame Point and Corozal.

638. Gobionellus lyricus (Girard).

Gobius lyricus Girard, Proc. Ac. Nat. Sci. Phila., 1858, 169 (Brazos

Santiago, Texas); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2224.

Gobius wurdemanni Girard, Proc. Ac. Nat. Sci. Phila., 1858, 169 (Brazos Santiago, Texas; female).

Smaragdus costalesi Poey, Memorias, II, 1861, 280 (Havana).

Euctenogobius lyricus Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1883, 633.

Head 3.65 to 4.15; depth 4.3 to 5; D. VI-11, rarely 10 or 12; A. 11 or 12; scales 29 to 32.

Body rather robust, compressed; head as wide as deep; snout very short and blunt, 3.8 to 5 in head; eye moderate, 2.9 to 3.5; interorbital not much broader than pupil; mouth inferior, nearly horizontal; maxillary reaching below middle of eye, 2.2 to 2.8 in head; teeth minute, the outer series in each jaw somewhat enlarged and separated from a band of very minute teeth by an interspace, the outer series of lower jaw anteriorly followed by 3 or 4 enlarged cusps; scales rather large, ctenoid on body, cycloid and reduced on nape, chest and abdomen; dorsal fins separate, the anterior 3 or 4 spines much produced, filamentous in adult male, reaching nearly or quite to base of caudal, more than half the length of body; the second dorsal high, with the posterior rays reaching to or beyond base of caudal in adult male, the fins low and without produced rays in the female; caudal fin lanceolate, 2.5 in body in adult males, shorter in females; anal fin similar to second dorsal; ventral disk rather small, failing to reach vent; pectoral reaching well beyond the ventral, usually about equal to length of head.

Color olivaceous; sides usually with 4 or 5 faint dark bars and with irregular dark blotches; spinous dorsal with dark dots, the produced rays in the male dusky; second dorsal in female merely with dark dots, in male with dark dots on the anterior rays and a black bar at base extending on posterior ray; caudal fin in females translucent, slightly barred with dusky, dark in males, with 2 longitudinal white stripes, one on the upper lobe and one on the lower; anal fin and ventral disk in female pale, dusky in male; pectoral fins nearly plain translucent in female, dusky in male, and with pearly spots forming cross-bars.

This species is represented by 12 specimens, ranging in length from 35 to 85 mm.

Known from Texas to the Lesser Antilles, and now for the first time recorded from the Atlantic coast of Panama. Our specimens are all from very muddy, brackish pools at Mindi, Canal Zone.

639. Gobionellus smaragdus (Cuvier & Valenciennes).

Gobius smaragdus Cuvier & Valenciennes, Hist. Nat. Poiss., XII, 1837, 120 (Cuba); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2227.

Smaragdus valenciennesi Poey, Memorias, II, 1861, 280 (Cuba).

Gobionellus smaragdus Poey, Syn. Pisc. Cub., 1868, 394.

Head 4; depth 5.25 to 5.9; D. VI-11 or 12; A. 11 or 12; scales 39 to 42.

Body moderately elongate, compressed; head not compressed; snout short; eye moderate, 4 to 5 in head; mouth large, slightly oblique; lower jaw slightly the shorter; maxillary reaching below pupil or to posterior margin of orbit, 2.1 to 2.35 in head; teeth in bands, the outer row in upper jaw enlarged and separated from the narrow succeeding band by an interspace; scales posteriorly ctenoid, becoming cycloid anteriorly; caudal fin produced, 2.25 to 2.5 in body.

Color of male light olive, with dark olive blotches; body and head with many conspicuous round, cream-colored spots, each surrounded by a dusky ring, these smaller than pupil and most distinct on head; snout with dusky streaks; dorsal and caudal plainly barred; pectorals crossed with dark wavy lines, dusky at base; anal and ventrals dusky; a small dark spot at base of caudal; a bright deep green spot inside of mouth in life. Female nearly plain olivaceous.

This species was not seen by us and is not recorded from Panama, but it may be expected there, since it has been taken at localities both north and south of the Isthmus. The above description is compiled from published accounts.

Known from South Carolina to Rio de Janeiro.

640. Gobionellus stigmaticus (Poey).

Smaragdus stigmaticus Poey, Memorias, II, 1861, 281 (Cuba).

Gobionellus stigmaticus Poey, Syn. Pisc. Cub., 1868, 394.

Gobius stigmaticus Jordan, Proc. U. S. Nat. Mus., 1886, 49; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2224, Pl. CCCXXVI, fig. 787.

Head 3.5 to 3.9; depth 5.5 to 6.6; D. VI-11 or 12; A. 12 or 13; 34 to 38 oblique series of scales on sides.

Body elongate, compressed; head as broad as deep; snout short, blunt, 4 to 4.65 in head; eye large, 3.55 to 4; interorbital narrow, less than half the width of eye; mouth terminal, horizontal; maxillary scarcely reaching middle of eye, 2.45 to 3.15 in head; teeth in the jaws in bands, the outer series in each jaw enlarged, the enlarged series in upper jaw separated from the others by an interspace; scales rather large, ctenoid, somewhat reduced anteriorly, wanting on head, nape and chest; dorsal fins well separated, all the rays shorter than head, the spines sometimes slightly filamentous; caudal fin pointed, notably longer than head in adult; anal fin similar to second dorsal; ventral disk moderate, reaching vent; pectoral fins rather long, pointed, reaching slightly past tip of ventrals, 1 to 1.35 in head.

Color brownish; median line of sides with a series of 5 more or less elongate dark spots; body elsewhere with irregular dark markings, formed by punctulations; nape sometimes with indistinct cross-bars; dorsal and caudal fins barred with dark; anal fin pale, with series of dark spots on base and a slightly dusky intramarginal band; ventral disk dusky, with a broad pale margin; pectoral fins plain translucent.

This species was taken only in brackish water. We have at hand 25 specimens, ranging in length from 25 to 65 mm.

Known from North Carolina to Rio de Janeiro. Our specimens are from Mindi and Porto Bello.

641. Gobionellus manglicola (Jordan & Starks).

Gobius manglicola Jordan & Starks, in Jordan, Proc. Cal. Ac. Sci., 2nd Ser., V, 1895, 495 (Mazatlan); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2220.

Head 3.95 to 4.3; depth 5 to 6; D. VI-12; A. 13; scales 31 to 35.

Body elongate, anteriorly as broad as deep, posteriorly compressed; head short, quite as broad as deep; snout very blunt, short, 3.5 to 5.15 in head; eye small, superior, 3.5 to 4.2 in head; interorbital very narrow, furrowed; mouth terminal, slightly oblique; maxillary reaching middle of eye, 2.5 to 2.6 in head; teeth in jaws pointed, the upper jaw with an enlarged outer series well separated from an irregular series or narrower band of minute teeth; lower jaw with a band of pointed teeth, the outer ones enlarged but not as much so as in upper jaw; gill-membranes broadly attached to the isthmus; scales rather large, ctenoid, wanting on back in advance of dorsals and on head and chest; dorsal fins well separated, none of the spines of the anterior dorsal produced, shorter than head; second dorsal low, the posterior rays failing to reach the base of caudal; caudal fin pointed, about 1.5 times the length of head; anal fin similar to second dorsal; ventral fins forming a rather broad disk, free from abdomen; pectoral fins rather short, not reaching beyond ventral disk, 1.28 to 1.4 in head.

Color olivaceous above, paler below; sides and back with irregular brownish markings, largest and most distinct along median line of side; a caudal spot present; dorsal, caudal and pectorals more or less distinctly barred with brownish spots; spinous dorsal in male with a jet-black membrane between the fourth and fifth spines and a fairly distinct whitish bar at base; caudal fin in male less distinctly barred than in female, with a white horizontal bar on upper half of fin; anal fin pale or slightly dusky; ventral disk pale, with a broad black margin in male specimens, dusky, with broad pale margin in the female.

We have 3 specimens, 2 males and 1 female, ranging in length from 40 to 42 mm., which, in the absence of material for comparison, we refer somewhat doubtfully to this species. The scales in our specimens do not become smooth posteriorly and the lower jaw does not protrude as described in the type.

Previously recorded only from Mazatlan. Our specimens are from tide pools at Panama City.

642. **Gobionellus encæomus** (Jordan & Gilbert).

Gobius encæomus Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882 (1883), 611 (Charleston, South Carolina); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2223.

Head 3.75; depth 5.7; D. VI-11; A. 12; scales 33 to 36.

Body elongate, notably compressed; head quite as broad as deep; snout very short and blunt, 4.5 to 6 in head; eye partly superior, 3.75 to 4; interorbital narrow, not much wider than pupil; cheeks swollen; mouth rather small, terminal, nearly horizontal; maxillary reaching opposite middle of eye, 2.6 in head; teeth in the jaws well developed, in bands, curved inward, the outer series in upper jaw somewhat enlarged and well separated from the others; isthmus broad; scales ctenoid, wanting in advance of first dorsal and on median line of abdomen; dorsal fins well separated, the first with low, slender spines, shorter than the head; second dorsal highest posteriorly, the last rays reaching nearly to base of caudal; caudal fin scarcely pointed, only slightly longer than head; anal fin similar to second dorsal; ventral disk rather long, reaching vent (male); pectoral fins reaching tip of ventrals, 1.15 to 1.2 in head.

Color dark olivaceous; median line of sides with a series of 5 elongate dark spots, two or three of them on middle of sides with upward projections, forming V-shaped bars (in male); a black spot, slightly larger than the pupil, above and behind the upper angle of gill-opening; dorsals and caudal with dark dots, forming cross-bars; anal fin pale, with an indication of a dark longitudinal intramarginal bar; ventral disk dusky or with a broad pale margin; pectoral fins pale translucent.

We have 2 specimens, 30 and 40 mm. long, which we doubtfully refer to this species.

Heretofore known from South Carolina to the Florida Keys. Our specimens were taken in a brackish drainage ditch at Colon.

643. Gobionellus boleosoma (Jordan & Gilbert).

Gobius boleosoma Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 295 (Laguna Grande, Pensacola, Florida); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2221.

Ctenogobius boleosoma Starks, Leland Stanford Jr. Univ. Pub., Univ. Series., 1913, 68 (Natal).

Head 3.45 to 3.7; depth 4.35 to 5.25; D. VII-11 or 12; A. 9 or 10; scales 27 or 28.

Body compressed; head quite as broad as deep; snout very short and blunt, 5.5 to 6.5 in head; eyes rather large, 3.05 to 3.8 in head; interorbital space about half the width of eye; mouth rather small, terminal, oblique; maxillary reaching anterior margin of pupil, 2.6 to 2.75 in head; teeth moderate, in bands in each jaw, the outer ones enlarged, those of the upper jaw separated from the others by an interspace; isthmus broad; scales ctenoid, wanting on back in advance of second dorsal, head, chest and abdomen; dorsal fins low, well separated, none of the rays as long as head; caudal fin broadly rounded, shorter than head; anal fin similar to second dorsal; ventral disk rather short, failing to reach vent; pectorals moderate, reaching opposite vent, 1 to 1.2 in head.

Color grayish, sides with dark markings, forming indistinct cross-bars; base of caudal with 2 small irregular spots; fins mostly plain translucent; the anal fin and ventral disk dusky; pectoral fins with an indication of a dark bar on base.

We have 3 specimens, respectively 23, 27 and 30 mm. in length, which we somewhat doubtfully refer to this species. Typical specimens of *G. boleosoma* have 6 dorsal spines and the caudal fin produced, lanceolate, in adult males.

Previously recorded only from Pensacola, Florida, and Natal, Brazil. Our specimens are from a brackish creek near Mindi and from tide pools at Colon.

230. Genus **Bollmannia** Jordan.

Bollmannia Jordan, in Jordan & Bollman, Proc. U. S. Nat. Mus., 1889, 164 (type *Bollmannia chlamydes* Jordan).

Body elongate, more or less compressed; interorbital narrow and without trace of a median keel; no fleshy processes on inner edge of shoulder girdle; teeth in the jaws in several series; scales large, ctenoid, not much reduced anteriorly, present on nape and cheeks.

644. Bollmannia chlamydes Jordan.

Bollmannia chlamydes Jordan, in Jordan & Bollman, Proc. U. S. Nat. Mus., 1889, 164 (Albatross Stations 2800, 2802, 2803, 2804 and 2805; Panama Bay, 7 to 51½ fathoms); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2238, Pl. CCCXXVIII, fig. 791; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 174.

Head 3.5; depth 4.5; D. VII-15; A. 15; scales about 28.

Body rather robust, compressed; head large and heavy, its profile evenly curved; eye longer than snout, 3.75 to 4 in head; interorbital very narrow, concave, its least width about one-third of eye; mouth very large, oblique, the lower jaw projecting; maxillary reaching to opposite pupil, 2.2 to 2.3 in head; teeth in the jaws small, sharp, in several series, the outer one, especially in the lower jaw, somewhat enlarged; scales very large, ctenoid, little reduced on breast and nape, about 8 in advance of dorsal; top and sides of head with large scales; cheeks with four rows, opercles with 2 rows of scales above; dorsal spine slender, filamentous, the fifth the longest, 1.2 in head; first ray of soft dorsal 2.4 in head; caudal fin long, the median rays somewhat more than half the length of body; first anal ray equal to snout; ventrals 1.33 in head; pectorals 1.2.

Color olivaceous, darker above; scales with a few black dots, some of the posterior ones occasionally dark edged; sides with 8 to 10 obscure vertical dusky bars, narrower than the interspaces, and in some specimens wholly wanting; snout bluish; opercles with a dark shade; lips, gular region, and anterior branchiostegals very dark in males; upper part of spinous dorsal darkest, with a few lighter dark edged oval spots; a well marked black blotch between the last two spines; soft dorsal dusky, usually with about 3 well developed rows of lighter dark edged oval spots; anal dusky, crossed by 2 narrow bluish streaks; caudal, pectorals and ventrals dusky, tinged with blue; ventrals edged with pale.

This species was not taken by us. It is known only from specimens taken in Panama Bay by the Albatross. This fish apparently does not occur in shallow water along the shore. The above description is compiled from published accounts of the species.

231. Genus **Aboma** Jordan & Starks.

Aboma Jordan & Starks, in Jordan, Proc. Cal. Ac. Sci., 2nd Ser., V, 1895, 497 (type *Aboma etheostoma* Jordan & Starks).

Body more or less compressed posteriorly; head depressed, rather long, somewhat pointed; mouth moderate, not very oblique; teeth in narrow bands, rather strong, the outer and inner series in each jaw enlarged; no flaps on shoulder girdle; scales large, ctenoid, wanting on head; dorsal spines short, not filamentous, more than 6 in number; soft dorsal and anal short, each with 10 to 12 rays; ventral fins united.

645. Aboma lucretiæ (Eigenmann & Eigenmann).

Gobius lucretiæ Eigenmann & Eigenmann, Proc. Cal. Ac. Sci., 2nd Ser., I, 1888, 57 (Pearl Island, Panama Bay).

Aboma lucretiæ Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2241; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 174.

Head 3.5; depth 5.33; D. VII-10; A. 12; scales 28.

Body slightly compressed posteriorly; head little wider than deep; eye placed high, equal to length of snout, 4.5 in head; mouth large, oblique; maxillary extending beyond posterior margin of eye, 2 in head; teeth in the jaws in narrow bands, recurved, the outer and inner series enlarged, largest in front; scales large, weakly ctenoid, becoming cycloid and very much crowded above and below pectoral; head, breast and anterior part of nape naked; dorsal spines slender, not filamentous; caudal fin pointed, 3 in length of body; ventrals 1.25 in head; pectorals longer than head.

Color light brown, with 4 oblique dark cross-bars as wide as the interspaces; 4 narrower transverse bars on nape and back; a large dusky spot at base of caudal; upper half of base of pectoral black; a black spot on opercle, margined above and behind with silvery; fins dusky.

This species was not seen by us. It is known from a single specimen taken at Pearl Island, Panama Bay. The above description is compiled from published accounts of the species.

232. Genus **Enypnias** Jordan & Evermann.

Enypnias Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2233 (type *Gobius seminudus* Günther).

This genus differs from *Garmannia* principally in the presence of 4 barbels about the mouth. Two of these are inserted on edge of upper jaw just behind the lip, somewhat below anterior nostril. The other 2 are on the chin, arising from the median frenum of the lower lip. Both nostrils, unlike in *Garmannia,* end in a short tube. Scales present on posterior part of body only; dorsal spines 6 or 7.

646. Enypnias seminudus (Günther).

Gobius seminudus Günther, Proc. Zoöl. Soc. London, 1861, 372 (West coast of Central America).

Garmannia seminuda Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2233.

Enypnias seminudus Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 173, Pl. XXIX, fig. 53 (Panama Bay).

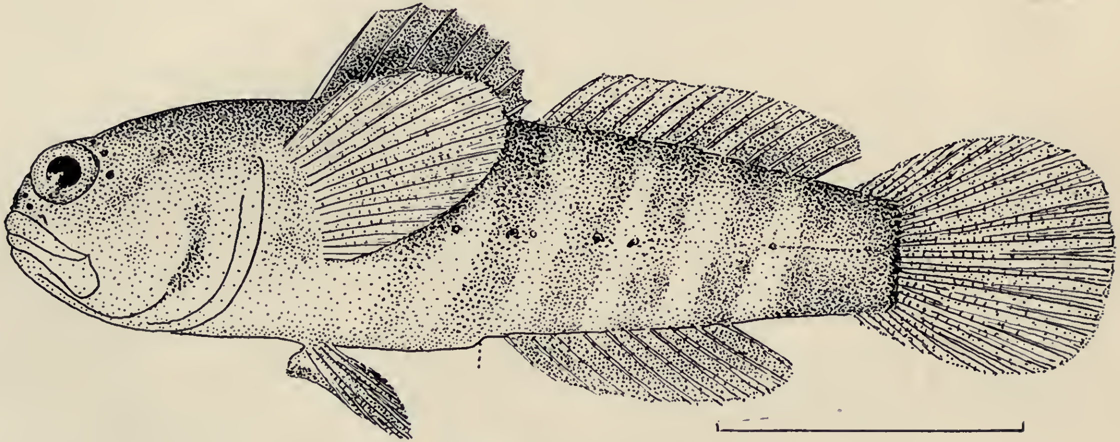
Head 3.25 to 3.4; depth 4 to 4.8; D. VII-14 to 16; A. 10 or 11; scales 50 to 60.

Body moderately robust, posteriorly compressed; head broader than deep; snout short, blunt, 3.75 to 4.6 in head; eye 4 to 5; interorbital a little more than half the width of eye; mouth rather large, terminal, oblique; maxillary reaching nearly to vertical from posterior margin of eye, 2.1 to 2.7 in head; teeth in bands, the outer series in each jaw and the inner series in the lower enlarged; both nostrils ending in a short tube; a short barbel just behind margin of upper lip below anterior nostril; chin with 2 barbels, springing laterally from the median frenum of the lower lip; upper surface of head with about 12 very large open pores; scales minute, ctenoid, wanting on back in advance of first dorsal, head, chest and median line of abdomen; first dorsal very low, none of the spines produced; second dorsal somewhat higher; caudal fin broadly rounded, shorter than head; anal fin similar to second dorsal but somewhat shorter; ventral disk short, failing to reach vent; pectoral fins moderate, reaching well beyond tip of ventral disk, 1.2 to 1.55 in head.

Color brownish, variable; males usually with broad black cross-bars; females usually speckled with pale spots; some specimens uniformly brown, others slightly marbled with black; fins often all dark, with pale margins; second dorsal and caudal spotted in the lighter colored specimens.

This fish is represented in the Panama collection by 9 specimens, ranging in length from 27 to 52 mm. The wide variation in color is striking, making the extreme phases appear as distinct species. Our specimens, taken in March, are in spawning condition.

Known only from the Pacific coast of Panama. The specimens are from Chame Point and from tide pools at Panama City.



GERHARDINUS NUDUS gen. et sp. nov.
Drawn from the type 36 mm. in length.

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233. Genus **Gerhardinus** gen. nov.

Type *Gerhardinus nudus* sp. nov.

This genus differs from *Enypnias* principally in having the body entirely naked. We take pleasure in naming this genus for William J. Gerhard, Associate Curator of the Division of Insects, Field Museum of Natural History, whose untiring efforts on the proofs of the present work have added much to its uniformity, accuracy and usefulness.

647. **Gerhardinus nudus** sp. nov. (Plate LXXXVIII.)

Type No. 81834, U. S. N. M.; length 36 mm.; tide pools, Panama City.

Head 3.15 to 3.6; depth 3.65 to 4.8; D. VI or VII-12 or 13; A. 10.

Body compressed posteriorly; head somewhat broader than deep; snout short and blunt, 4.25 to 5.55 in head; eye 3.6 to 4.35; interorbital about half the width of eye; mouth moderate, terminal, slightly oblique; maxillary reaching nearly or quite to vertical from posterior margin of eye, 2.25 to 2.5 in head; teeth in the jaws in bands, the outer series in each jaw and the inner series in the lower jaw somewhat enlarged; both nostrils ending in a very small tube; a minute barbel behind upper lip and below anterior nostril; chin with 2 small barbels; scales wanting; first dorsal low, none of the spines produced; second dorsal somewhat higher; caudal fin broadly rounded; anal fin similar to second dorsal but shorter; ventral disk small, failing to reach vent; pectoral fins reaching well beyond the tip of the ventral disk, 1.2 to 1.65 in head.

Color grayish brown; sides with or without small white dots and with narrow white cross-bars; median line of sides often with a row of black dots; first dorsal dusky, or merely with a black spot; second dorsal paler, more or less spotted with dusky; caudal plain translucent, with a dark line across base; anal fin dusky or black; ventral disk plain translucent, wholly black or pale, with a dark margin; pectoral fins pale. The sexes seem to be similarly colored.

We have 13 specimens of this little fish, ranging from 22 to 36 mm. in length. These specimens were all taken during March and most of them are gravid. Our smallest female, only 22 mm. in length, has the ovaries well distended with eggs.

Our specimens are all from tide pools at Balboa and Panama City.

234. Genus **Garmannia** Jordan.

Garmannia Jordan, Proc. Cal. Ac. Sci., 2nd Ser., V, 1895, 497 (type *Gobius paradoxus* Günther).

Body moderately robust, compressed; no barbels about the mouth; teeth in the jaws in bands, the outer series enlarged, canine-like; scales ctenoid, present only on posterior half of body; dorsal spines 6 or 7.

648. Garmannia paradoxa (Günther).

Gobius paradoxus Günther, Proc. Zoöl. Soc. London, 1861, 372 (West coast of Central America).

Garmannia paradoxa Jordan, Proc. Cal. Ac. Sci., 2nd Ser., V, 1895, 496, Pl. XLIX; Jordan & Evermann, Bull.. U. S. Nat. Mus., XLVII, 1898, 2232, Pl. CCCXXVII, fig. 790; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 172, Pl. XXVIII, fig. 52; Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 412 (Panama).

Head 3.5 to 3.75; depth 3.85 to 5; D. VI or VII-12; A. 9 or 10.

Body compressed; head compressed, broader than deep; snout short, obtuse, 4.8 to 6.1 in head; eye 4.15 to 5.6; interorbital not much broader than pupil; chin without barbels; mouth terminal, oblique; maxillary reaching nearly opposite posterior margin of eye, 2.15 to 2.6 in head; teeth in the jaws in bands, the outer series in each jaw enlarged and more or less separated by an interspace from the other teeth; gill-openings small, not longer than base of pectoral; scales ctenoid, present only on posterior part of body, i.e., behind vertical from origin of second dorsal, 16 to 19 series developed; dorsal fins separate, the rays all short in the female, the first spine filamentous in the male, reaching well beyond origin of the second dorsal; caudal fin broadly rounded; not produced in male, always shorter than head; anal fin similar to second dorsal; ventral disk small, failing to reach vent; pectoral fins reaching well beyond the ventrals, 1.25 to 1.55 in head.

Color of the male nearly uniform dark brown, the lighter colored specimens with indications of dark bars on back and a series of dark lateral spots; fins of about the same color as the body, except the ventral disk which is darker; pectorals often somewhat lighter; filamentous ray of the first dorsal and the margin of both dorsals white in spirits; the ground color of the female somewhat paler and the entire head and body, except the abdomen, which is usually wholly pale, speckled with pale spots; some specimens with more or less distinct cross-bars on back; dorsal and caudal fins densely speckled with black; anal and ventrals dusky, each with pale margin; pectorals slightly speckled or plain translucent.

This goby is the most abundant fish in the rocky tide pools at Panama City where numerous specimens, ranging from 20 to 52 mm. in length, were collected.

Known from Mazatlan to Panama. Our specimens are from tide pools at Balboa and Panama City.

235. Genus **Gobiosoma** Girard.

Gobiosoma Girard, Proc. Ac. Nat. Sci. Phila., 1858, 169 (type *Gobiosoma molestum* Girard).

Body compressed posteriorly; head more or less depressed; snout blunt; mouth moderate, horizontal; teeth in the jaws in several series or in bands, the outer row enlarged, no canines; barbels wanting; scales entirely wanting; shoulder girdle without flaps; dorsal spines usually 7, rarely 5 or 6; second dorsal and anal each with 11 to 14 rays.

649. Gobiosoma molestum Girard.

Gobiosoma molestum Girard, Proc. Ac. Nat. Sci. Phila., 1858, 169 (Indianola, Texas); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2258.

Gobiosoma alepidotum Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 297 (Laguna Grande, Pensacola, Florida).

Head 3.2 to 3.5; depth 4 to 4.5; D. VII-12 or 13; A. 12.

Body rather short and chubby; head depressed, more or less rounded above; mouth horizontal; maxillary reaching posterior margin of orbit; teeth in the jaws in several series, the outer ones somewhat enlarged. Color olivaceous, with dark points; sides with narrow alternating light and dark bars; a row of small dark spots along middle of sides; breast with many well defined spots; a dark line running forward and downward from eye to angle of mouth, another extending straight downward from eye; a black bar on edge of preopercle, and a black spot on upper edge of opercle; first dorsal with 3 oblique dark bars; second dorsal, caudal and pectorals finely barred; base and edge of anal light, middle dark.

This fish was not taken on the coast of Panama but may be expected there, because it is recorded from localities both north and south of the Isthmus. The above description is compiled from published accounts.

Known from the Gulf coast of the United States south to Bahia, Brazil.

236. Genus **Evermannia** Jordan.

Evermannia Jordan, Proc. Cal. Ac. Sci., 2nd Ser., IV, 1895, 592 (type *Gobiosoma zosterurum* Jordan & Gilbert).

Body slender, compressed behind; head long, slender, snout pointed; maxillary more or less produced backward; teeth small, slender, in narrow bands in each jaw, the outer ones in upper jaw slightly enlarged; a rather long flexible dermal flap on shoulder-girdle; scales very small, embedded, visible only under strong magnification; first dorsal with 4 spines; second dorsal and anal each with about 13 to 16 rays; caudal fin lanceolate; ventral fins united.

KEY TO THE SPECIES.

a. Second dorsal with 15 rays; second dorsal, caudal and anal in male with black bands; second dorsal and anal in female checkered, but without black bands. *zosterura*, p. 892.

aa. Second dorsal with 16 rays; second dorsal and caudal in male mostly translucent, without black bands, the anal fin black at base, its upper half plain translucent; second dorsal and caudal in female more or less dusky, with plain translucent membranes, the anal fin with dusky base, the marginal third translucent or whitish. *panamensis*, p. 893.

650. Evermannia zosterura (Jordan & Gilbert).

Gobiosoma zosterurum Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881, 361 (Mazatlan).

Evermannia zosterura Jordan, Proc. Cal. Ac. Sci., 2nd Ser., V, 1895, 498, Pl. LI (Mazatlan); Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 178 (Panama Bay).

Head 3.25; depth 5 or 6; D. IV-15; A. 14 or 15.

Body long, compressed; head rather long; snout not very blunt, about 5 in head; eye placed high, equal to length of snout; mouth oblique, terminal; maxillary reaching posterior margin of eye; teeth small, in villiform bands, the outer ones in upper jaw slightly enlarged; shoulder girdle with a single rather long flexible appendage; scales few in number, embedded, visible only when detached portions of the skin are placed under high magnification; spinous dorsal high in male, the first spine filamentous, reaching to middle of soft dorsal, notably lower in female; caudal fin shorter than head; ventral fins rather long, united; pectoral fins shorter than ventrals, 2 in head.

Color of male olivaceous, sometimes vaguely barred with traces of 8 olive cross-bands; dorsal and anal yellowish at base, then a broad median band of jet-black, then a broad white margin; middle of caudal yellow to tip, with a black longitudinal band above and below, with white margin above and below; pectorals and ventrals dusky; female with dorsals and anal plainly checkered with black; caudal fin faintly barred; all vertical fins with pale margins but without the black stripes of the male.

This species was not seen by us. The above description is compiled from published accounts. The species is known from Mazatlan and Panama. The Panama records are based on 7 specimens secured by Prof. C. H. Gilbert and associates in 1896.

651. Evermannia panamensis Gilbert & Starks.

Evermannia panamensis Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 179, Pl. XXX, fig. 55 (Panama).

Head 3.2; depth 5.5; D. IV-16; A. 14.

Body slender, compressed, tapering little posteriorly; head rather long; eye small, 6.5 in head; interorbital narrow, less than half the diameter of eye; mouth large, slightly oblique, the lower jaw included; maxillary reaching an eye's diameter beyond eye, about 2 in head; teeth minute, in a narrow band on edge of each jaw, the outer ones slightly enlarged; shoulder-girdle with a rather long flexible appendage; scales small, cycloid, partially embedded, not easily distinguishable; the anterior dorsal spines produced, the first filamentous in the male; second dorsal and anal similar; caudal fin lanceolate; ventral fins united, rather long; pectorals short, failing to reach beyond tip of ventrals.

Color of male in alcohol dusky brown, somewhat lighter on median line of abdomen; a faint vertical dark line below the eye; dorsal, pectorals, ventrals and upper half of caudal with translucent membranes and dusky rays; lower half of caudal black; base of anal black, its upper half translucent. Color of female lighter and the pattern less uniform; the ground color light olive; the upper parts of head and back finely mottled with brown; sides of body with narrow streaks; upper half of caudal plain or faintly cross-banded, the lower half translucent or faintly shaded, the two halves never strongly contrasting as in the male; basal two-thirds of anal fin dusky, the marginal third translucent or whitish.

This species was not seen by us. The above description is compiled from the original. The species is said to differ from *E. zosterura* in being more extensively scaled, in having one or two more soft rays in the dorsal and anal fins, and in coloration. This fish is known only from Panama reef, where Prof. C. H. Gilbert and associates took 40 specimens in tide pools in 1896. Although the tide pools on this reef were thoroughly fished by us in 1912, the species was not taken.

237. Genus **Gobioides** Lacépède.

Gobioides Lacépède, Hist. Nat. Poiss., II, 1800, 576 (type *Gobius broussonnetii* Lacépède).

Plecopodus Rafinesque, Analyse Nat., etc., 1815, 87 (substitute for *Gobioides*, regarded as objectionable).

Ognichodes Swainson, Nat. Hist. & Class. Fish., II, 1839, 183 and 278 (type *Gobioides broussonnetii* Lacépède; a needless substitute).

Body very elongate, compressed posteriorly; head small; eyes very small; mouth large, oblique, the lower jaw projecting; teeth in the jaws in bands, the outer series much enlarged; scales very minute; dorsal rays V to VII, 15 to 23; anal 16 to 23; dorsal fin low, continuous; soft dorsal and anal joined to base of caudal; ventrals united in a disk, free from abdomen.

652. **Gobioides broussonnetii** Lacépède.

Gobioides broussonnetii Lacépède, Hist. Nat. Poiss., II, 1800, 580, Pl. XVII, fig. 1 (probably from Surinam, "given by Holland to France"); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2263.

Amblyopus brasiliensis Bloch & Schneider, Syst. Ichth., 1801, 69 (Brazil; on a drawing made by Prince Maurice).

Gobius oblongus Bloch & Schneider, Syst. Ichth., 1801, 548 (based on Lacépède).

Gobioides barreto Poey, Memorias, II, 1861, 282 (Cuba).

Amblyopus mexicanus O'Shaughenessy, Ann. & Mag. Nat. Hist., 4th Ser., XV, 1875, 147 (Mexico).

Gobioides broussoneti Jordan & Eigenmann, Proc. U. S. Nat. Mus., 1886, 512.

Head 5.25 to 7; depth 14; D. VI or VII, 15 to 17; A. 16 or 17. Body elongate, compressed; eye small, but evident, 7 to 10 in head; mouth oblique; maxillary extending beyond eye; teeth in the jaws in bands, the outer series enlarged; scales larger than in related species, becoming smaller anteriorly, not imbricated.

Color brownish, violet bars extending downward and forward on upper part of body, sometimes with a lighter or darker dot at the end of each bar; head marbled or spotted with dark violet or brown.

This fish was not seen by us. The above description is compiled from published accounts. It has been recorded from New Orleans, La., to Brazil, and may, therefore, be expected on the Panama coast. This species is said to reach a length of about 500 mm. or more.

Family LXXV. **Echeneididæ.**

THE REMORAS.

Body elongate or slender; head depressed above, with a large oval disk consisting of crosswise partitions or laminæ and a single lengthwise septum; lower jaw projecting beyond upper; mouth wide; teeth villiform, present on jaws, vomer, palatines and usually on tongue; gill-arches 4; gill-membranes free from the isthmus; branchiostegals 7; scales minute, cycloid; air-bladder wanting; dorsal and anal fins long and low; ventral fins thoracic; pectoral fins placed high. Four genera are represented in American waters, only two of which have as yet been recorded from Panama but a third one may be expected there. The fishes of this family are instantly recognized by the presence of the large oval sucking disk on the head, by means of which they adhere firmly to sharks and other fishes as well as to turtles, boats and other objects. The sucking disk is regarded by ichthyologists as a modified spinous dorsal fin.

KEY TO THE GENERA.

a. Body long and slender; ventral fins narrowly adnate to the abdomen; lower jaw produced in a flap.
b. Laminæ 10. *Phtheirichthys*, p. 895.
bb. Laminæ 20 to 28. *Echeneis*, p. 896.
aa. Body rather robust; ventrals rather broadly adnate to abdomen; lower jaw not produced as a flap; laminæ 13 to 18. *Remora*, p. 897.

238. Genus **Phtheirichthys** Gill.

Phtheirichthys Gill, Proc. Ac. Nat. Sci. Phila., 1862, 239 (type *Echeneis lineata* Menzies).

Body very elongate; disk with only 10 laminæ; other characters mostly as in *Echeneis*. A single species is known.

653. Phtheirichthys lineatus (Menzies).

Echeneis lineata Menzies, Trans. Linn. Soc. London, I, 1791, 187, Pl. XVII, fig. 1 (Pacific Ocean, between the tropics).

Echeneis tropica Euphrasen, Handl. K. Sven. Vet.-Aked., XII, 1791, 317 (Atlantic, between the tropics).

Echeneis apicalis Poey, Memorias, II, 1861, 254 (Cuba).

Echeneis sphyrænarum Poey, Memorias, II, 1861, 255 (Cuba; on Barracudas).

Phthirichthys lineatus Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1882 (1883), 969.

Phtheirichthys lineatus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2268.

This species was not seen by us. The following description is copied from Jordan & Evermann (1898):

"Head 5; disk twice as long as broad, its length 4½ in body. D. X-33; A. 33. Lower jaw very narrow, much projecting. Body blackish, with 2 whitish lateral bands; all the fins white-margined."

A widely distributed species, inhabiting tropical seas. It is not recorded from Panama but it may be expected there.

239. Genus **Echeneis** Linnæus.

Echeneis Linnæus, Syst. Nat., Ed. X, 1758, 260 (type *Echeneis naucrates* Linnæus).

Leptecheneis Gill, Proc. Ac. Nat. Sci. Phila., 1864, 60 (type *Echeneis naucrates* Linnæus).

Body slender, fusiform; disk long, with 20 to 28 laminæ; soft dorsal with numerous short rays; anal similar, the anterior rays somewhat elongate; caudal slightly concave behind; ventrals long, the inner rays narrowly adnate to abdomen; pectorals pointed, the rays soft and flexible.

654. Echeneis naucrates Linnæus.

Echeneis neucrates (misprint for *naucrates*) Linnæus, Syst. Nat., Ed. X, 1758, 261 ("in Pelago Indico"); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2269, Pl. CCCXXIX, fig. 796; Boulenger, Boll. Mus. Zoöl. Anat. Torino, XIV, No. 346, 1899, 3 (Gulf of Panama); Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 180.

Echeneis albacauda Mitchill, Amer. Monthly Mag., II, 1818, 244 (New York).

Echeneis lunata Bancroft, Proc. Zoöl. Soc. London, I, 1831, 134 (Jamaica).

Echeneis vittata Rüppell, Neue Wirbelthiere, 1835, 82 (Red Sea).

Echeneis fusca Gronow, Cat. Fish, 1854, 92 (after *E. naucrates* Linnæus).

Echeneis guaican Poey, Memorias, II, 1861, 248 (Cuba).

Echeneis metallica Poey, Memorias, II, 1861, 252 (Cuba).

Echeneis verticalis Poey, Memorias, II, 1861, 253 (Cuba).

Leptecheneis naucrates Gill, Proc. Ac. Nat. Sci. Phila., 1864, 61.

Head 4.8 to 5.25; depth 12.3 to 14.6; D. 31 to 35; A. 30 to 34.

Body slender; head depressed, bearing a sucking disk composed of 23 or 24 laminæ; length of disk 3.5 to 3.9 in head; snout broadly angular, notably shorter than the broad flap-like lower lip, its length 1.95 to 2.45 in head; eye 4.2 to 5.8; interorbital 1.9 to 2.3; mouth moderate, oblique; maxillary 2.9 to 3.3 in head; teeth in villiform bands, present on jaws, tongue and on practically the entire roof of mouth; gill-rakers small, scarcely half the length of eye, about 15 on lower limb of first arch; scales minute; dorsal fin rather low, somewhat elevated anteriorly; caudal fin long, the median rays produced, filamentous in the smallest specimen at hand; anal fin a little higher anteriorly than dorsal, its origin under that of the dorsal, and coterminal with it; ventral fins rather long, pointed, as long as pectorals, the inner rays adherent to abdomen at base; pectoral rays more or less pointed, 1.4 to 1.8 in head.

Color dark brown above and below; sides of head with a black stripe extending from snout through eye; dorsal and anal dark brown, the distal parts of the anterior rays pale; caudal fin black, with the outer rays pale; ventral and pectoral fins mostly dark brown in our darkest specimens, largely pale in the lighter colored ones.

There are 6 specimens of this species at hand, ranging in length from 62 to 165 mm. This species adheres to larger fish apparently regardless of species and is carried about by them, but they occasionally forsake their host and are taken separately. One of our specimens was taken separately, one adhering to a shark and four of them, taken by H. Pittier, are reported to have adhered to "Picudo" (barracuda) fishes.

Known from all warm seas. Recorded from the Gulf of Panama by Boulenger. Our specimens are all from the Atlantic coast, viz., Mindi Cut, Porto Bello and Alligandi on the San Blas coast. The specimens from Alligandi were collected by H. Pittier.

240. Genus **Remora** Gill.

Remora Gill, Proc. Ac. Nat. Sci. Phila., 1862, 239 (type *Echeneis remora* Linnæus).

Remoropsis Gill, Proc. Ac. Nat. Sci. Phila., 1863, 88 (type *Echeneis brachypterus* Lowe).

Remorina Jordan & Evermann, Rept. U. S. Fish Comm., XXI, 1895 (1896), 490 (type *Echeneis albescens* Temmick & Schlegel).

Body comparatively stout; disk relatively short, with 13 to 18 laminæ; soft dorsal with 22 to 32 rays; anal rays 22 to 30; caudal with straight or slightly concave margin; ventrals rather short, broadly adnate to abdomen; pectorals short, rounded.

KEY TO THE SPECIES.

a.	Laminæ about 18: dorsal rays 23.	*remora*, p. 898.
aa.	Laminæ 13 to 16.	
b.	Dorsal rays 22; laminæ 13.	*albescens*, p. 898.
bb.	Dorsal rays 29 to 32; laminæ 14 to 16.	*brachyptera*, p. 899.

655. Remora remora (Linnæus).

Echeneis remora Linnæus, Syst. Nat., Ed. X, 1758, 260 ("in Pelago Indico").

Echeneis squalipeta Daldorf, Skriv. Nat. Selskab. Kjöb., II, 1793, 157

Echeneis jacobæa Lowe, Proc. Zoöl. Soc. London, 1839, 89 (Madeira).

Echeneis parva Gronow, Cat. Fish, 1854, 92 (no locality; after *E. remora* Linnæus).

Echeneis postica Poey, Memorias, II, 1861, 255 (Havana).

Remora jacobæa Gill, Proc. Ac. Nat. Sci. Phila., 1862, 240.

Remora remora Jordan, Proc. U. S. Nat. Mus., 1885, 372 (Panama); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2271; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 180.

Head 4; depth about 6.6; D. 23; A. 25.

Body comparatively robust, compressed behind; head rather broad, depressed; lower jaw not produced into a flap; maxillary reaching anterior margin of eye; disk longer than the dorsal or anal fin, consisting of about 18 laminæ; vertical fins rather high; caudal fin rather broad, with posterior margin concave; ventral fins joined to abdomen by more than half the length of the inner rays; pectoral fins short, broad, rounded, 1.6 in head.

Color nearly uniform dark brown.

This species was not taken by us, but it is recorded from the Pacific coast of Panama by Jordan, 1885. This remora is usually observed attached to large sharks.

A widely distributed species, occurring in the warm seas, and on both coasts of America, as far north as Woods Hole, Mass., on the Atlantic coast, and San Francisco on the Pacific.

656. Remora albescens (Temmick & Schlegel).

Echeneis albescens Temmick & Schlegel, in Siebold, Fauna Japon., Pisces, 1850, 272, Pl. CXX, fig. 3 (Japan); Günther, Cat. Fish. Brit. Mus., II, 1860, 377.

Remora albescens Jordan, Rept. U. S. Fish Comm., XIII, 1885 (1887), 854; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2272.

This species was not seen by us. It is characterized by the short disk which consists of about 13 laminæ and the short dorsal fin which has only about 22 rays. Its color is uniform grayish brown.

This remora inhabits the tropical Pacific, occasionally straying to the coast of America. It is not recorded from Panama, but it may be expected there.

657. Remora brachyptera (Lowe).

Echeneis brachyptera Lowe, Proc. Zoöl. Soc. London, 1839, 89 (Madeira).

Echeneis sex-decim lamellata Eydoux & Gervais, Mag. Zoöl., 1837, Cl. IV, 1, Pl. XVI (Indian Ocean?).

Echeneis quatuordecimlaminatus Storer, Bost. Journ. Nat. Hist., II, 1839, 496 (Holmes Hole).

Echeneis pallida Temmick & Schlegel, in Siebold, Fauna Japon., Pisces, 1850, 271, Pl. CXX, figs. 2 & 3 (Japan).

Remoropsis brachypterus Gill, Proc. Ac. Nat. Sci. Phila., 1864, 60.

Remora brachyptera Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2272, Pl. CCCXXX, figs. 797 and 797a.

This remora was not taken by us. It is characterized by the short disk which consists of 14 to 16 laminæ and by the long dorsal fin which has 29 to 32 rays. The color is light brown above and darker below.

A widely distributed species, occurring in warm seas. It is not recorded from Panama but it may be expected there.

Family LXXVI. **Opisthognathidæ.**

THE JAW-FISHES.

Body oblong or elongate, low, moderately compressed; head large, naked, the anterior profile decurved, no ridges, spines, or crests; mouth wide, terminal, horizontal; premaxillaries protractile; supplemental maxillary present; teeth pointed, in bands on jaws, usually one or a few on vomer; opercles unarmed; pseudobranchiæ present; gills 4, a slit behind the fourth; gill-membranes somewhat united; branchiostegals 6; dorsal and anal long and low, the spines of the dorsal flexible and passing gradually into the soft rays; ventral fins jugular, I, 5 rays. A single genus and 2 species are known from the Pacific coast of Panama.

241. Genus **Opisthognathus** Cuvier.

Opistognathus Cuvier, Règne Animal, Ed. I, II, 1817, 252 (type *Opistognathus sonnerati* Cuvier; *Opisthognathus* intended?).

Gnathypops Gill, Proc. Ac. Nat. Sci. Phila., 1862, 241 (type *Opisthognathus maxillosus* Poey).

Body oblong or elongate, compressed posteriorly at least; head large, with no spines, ridges or crests; mouth terminal, horizontal, wide; the maxillary moderate, truncate in female, greatly produced in the male; teeth pointed, in bands on the jaws; gill-rakers rather long, slender.

KEY TO THE SPECIES.

a. Anterior part of dorsal fin with a large black ocellus and with pale spots; caudal fin with 2 large pale spots at the base; scales 135 to 155. *scops,* p. 900.

aa. No black blotch or ocellus on dorsal fin, posterior part of dorsal fin with white ocelli; the caudal fin without 2 large pale spots at base; scales about 125. *punctata,* p. 901.

658. **Opisthognathus scops** (Jenkins & Evermann).

Gnathypops scops Jenkins & Evermann, Proc. U. S. Nat. Mus., 1888, 152 (Guaymas); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2283.

Opisthognathus ommata Jenkins & Evermann, Proc. U. S. Nat. Mus., 1888, 153 (Guaymas).

Opisthognathus ommatum Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2282.

Head 3 to 3.3; depth 3.4 to 3.75; D. 27 or 28; A. 19 or 20; scales 135 to 155.

Body rather robust anteriorly, compressed, tapering posteriorly; head large, not quite as broad as deep; snout very short, 5 to 6 in head; eye very large, 2.75 to 3.1 in head; interorbital 11 to 14; mouth large, horizontal; jaws subequal; maxillary moderate in female, truncate, failing to reach margin of preopercle, 1.5 to 1.7 in head, produced in a flexible, pointed flap in the male, reaching the bony margin of opercle, nearly or quite equal to length of head; teeth pointed, in bands on jaws, the outer series on upper jaw enlarged, a single pointed tooth on vomer; gill-membranes connected at isthmus; gill-rakers slender, scarcely half the length of the eye, 25 to 30 on the lower limb of first arch; scales small, wanting on head; lateral line present on anterior half of body only; head with many pores; dorsal fin long and low; caudal fin rounded; anal fin similar to dorsal, but shorter and coterminal with it; ventral fins narrow, quite as long as the pectorals, inserted in advance of pectorals; pectoral fins broad, the posterior margin round, 1.7 to 2 in head.

Color brown, irregularly mottled with dark; head with small blackish spots, smaller than on body; the maxillary with cross-bars, with black on lower margin near angle of mouth, the lower margin and inner surface of the produced flap in male whitish; dorsal fin blackish, with pale spots; a large elongate black ocellated spot on anterior rays of dorsal; caudal fin dark, with 2 large pale spots at base and smaller ones on distal parts of fin; anal fin black, with pale brown base; ventral fins brownish black; pectoral fins pale brown, with small pearly spots at base.

This species is represented by 4 specimens, ranging in length from 75 to 160 mm. Our specimens show that *Gnathypops scops* Jenkins & Evermann is the female of *Opisthognathus ommata* Jenkins & Evermann. We have examined the type specimens of these nominal species, and it seems quite probable that all the species of *Gnathypops* are based on females and that all species of *Opisthognathus* are based on males. The genus *Gnathypops* Gill, therefore, becomes untenable.

Previously recorded only from Guaymas. Our specimens are all from Balboa, taken on rocky bottom by the use of dynamite.

659. **Opisthognathus punctata** Peters.

Opisthognathus punctatus Peters, Monatsb. k. Ak. Wiss. Berlin, 1869, 708 (Mazatlan).

Opisthognathus punctata Jordan, Proc. Ac. Nat. Sci. Phila., 1883 (1884), 290; Jordan, Proc. U. S. Nat. Mus., 1885, 389 (Panama).

Opisthognathus punctatum Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2281; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 180.

This species is recorded from Panama by Jordan (1885), the record being based on a specimen taken by Gilbert. The species has not been seen by other collectors. We quote below the description from Jordan & Evermann which the authors state is based on the original specimen from Mazatlan.

"D. 28; A. 18. Body moderately elongate; scales very small, about 125 in lateral line. Dorsal spines continuous with the soft rays. No vomerine teeth. Maxillary very long, extending slightly beyond head. Head everywhere finely speckled with black, the body more coarsely and irregularly spotted; pectoral finely and closely speckled, its edge plain; ventral fin dusky, similarly marked; dorsal without large black blotch, finely spotted, the spots behind gradually forming the boundaries of white ocelli, the base of the fins having rings of white around black spots, the upper part with dark rings around pale spots; caudal with pale spots, its edge, like that of the dorsal, somewhat dusky, not black; anal with a broad, blackish edge, and with dark spots, those near the base of the fin largest; lining membrane of maxillary with the usual bands of white and inky black."

Known from Mazatlan and Panama.

Family LXXVII. **Dactyloscopidæ.**

THE SAND STAR-GAZERS.

Body elongate, compressed posteriorly; head oblong, usually large, nearly plain above; eyes small, superior, well forward; suborbital without a bony stay; nostrils double; opercles more or less fringed; mouth nearly vertical; premaxillaries protractile, not forming the entire edge of upper jaw; lips fringed; gill-openings very broad, the membranes separate, free from the isthmus; pseudobranchiæ present or obsolete; dorsal fin long, divided or continuous, the anterior rays spinous; ventral fins jugular, I, 3. The fishes of this family are small and live on sandy shores of tropical America.

KEY TO THE GENERA.

a. Dorsal fin continuous.
b. Dorsal fin beginning on nape, in advance of origin of anal; pseudobranchiæ well developed. *Dactyloscopus,* p. 902.
bb. Dorsal fin beginning behind nape, a little behind origin of anal; pseudobranchiæ well developed. *Dactylagnus,* p .904.
aa. Dorsal fin divided, the first dorsal consisting of 4 free spines, free or connected by membrane. *Cokeridia* gen. nov., p. 905.

242. Genus **Dactyloscopus** Gill.

Dactyloscopus Gill, Proc. Ac. Nat. Sci. Phila., 1859, 132 (type *Dactyloscopus tridigitatus* Gill).

Esloscopus Jordan & Evermann, Rept. U. S. Fish Comm., XXI, 1895 (1896), 465 (type *Dactyloscopus zelotes* Jordan & Gilbert).

Body moderately elongate; head cuboid; eyes small; mouth nearly vertical; lower jaw projecting, without barbels; pseudobranchiæ very small or obsolete; origin of dorsal on nape in advance of origin of anal, the fin continuous. Four species of this genus are recognized. However, only a single one comes within the scope of the present work.

KEY TO THE SPECIES.

a. Dorsal rays XII, 28; A. II, 32; scales about 45.
tridigitatus, p. 903.

aa. Dorsal rays VI, 38; A. II, 37; scales about 51.
zelotes, p. 903.

660. Dactyloscopus tridigitatus Gill.

Dactyloscopus tridigitatus Gill, Proc. Ac. Nat. Sci. Phila., 1859, 132 (Barbados); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2301; Starks, Leland Stanford Jr. Univ. Pub., Univ. Ser., 1913, 71 (Natal, Brazil).

Head 5 in total length; depth 7; D. XII, 28; A. II, 32; scales 45.

Body slender, much compressed posteriorly; opercular fringe consisting of 15 separate filaments; pseudobranchiæ very small; origin of dorsal over lower angle of base of pectorals, or immediately before the margin of opercle, the distance from snout 5 in total length of body.

Color in life that of pale sand above, whitish below; 12 narrow cross-bands of whitish on back, not extending down far on sides; head mottled above; fins all pale.

Known from Key West and the West Indies; recorded from Natal, Brazil, by Starks (1913) who says, "In life they are of a transparent flesh-color. When frightened they bury themselves in the sand." This species was not seen by us and is not recorded from Panama, but its range brings it within the scope of the present work.

661. Dactyloscopus zelotes Jordan & Gilbert.

Dactyloscopus zelotes Jordan & Gilbert, in Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2303 (Panama); Gilbert & Starks, Memoir. Cal Ac. Sci., IV, 1904, 181.

Head 4.5; depth 6.6; D. VI, 38; A. II, 37; scales 51.

Body slender, compressed; head narrow, cuboid, compressed; snout very short, about equal to length of eye; eyes small, superior, with little lateral range, about 6.6 in head; mouth nearly vertical; the lower jaw projecting; the lips fringed; subopercle and interopercle very wide and flexible, overlapping throat and base of ventral and pectoral fins; the opercle posteriorly with a membranous fringe; teeth present on jaws only, in narrow villiform bands; lateral line running near the back through 12 scales, then obliquely downward to middle of side; origin of dorsal on the nape, at a point from snout equal to depth of body, the first 6 rays of fin shorter than those following and not connected by membrane; caudal distinct, narrow, short; origin of anal under fourth dorsal spine; ventrals inserted under anterior margin of preopercle; pectorals short, 1.25 in head.

Color in spirits light olivaceous; the edgings of the scales, some vermiculations on top of head, and the labial fringe clear brown; fins translucent; the caudal with a brown bar at base.

This species was not seen by us. It is known only from the type taken at Panama City by Captain J. M. Dow. The above account of the species is taken from the original description of the type.

Known only from Panama City.

243. Genus **Dactylagnus** Gill.

Dactylagnus Gill, Proc. Ac. Nat. Sci. Phila., 1862, 504 (type *Dactylagnus mundus* Gill).

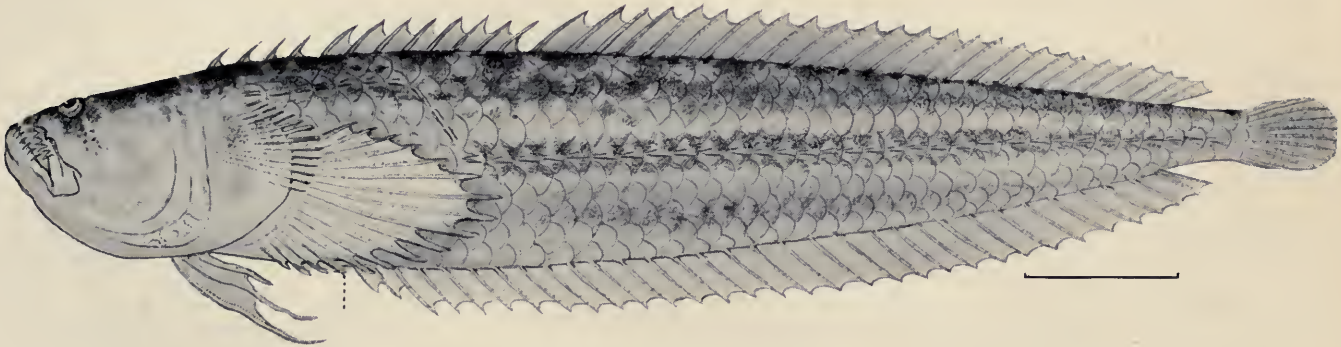
Body elongate; head cuboid; eye small, directed upward; mouth very oblique or nearly vertical; lower jaw projecting, without barbels; pseudobranchiæ well developed; dorsal fin entire, its origin a little behind origin of anal; base of anal fins slightly longer than the base of dorsal. A single species is known.

662. Dactylagnus mundus Gill.

Dactylagnus mundus Gill, Proc. Ac. Nat. Sci. Phila., 1862, 505 (Cape San Lucas); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2304 (Carmen Island, Gulf of California).

Head 4.75 to 5; depth 5.6 to 7.1; D. 41 to 43; A. 40 or 41; scales 47 to 51.

Body elongate, compressed, tapering posteriorly; head robust, nearly as broad as deep; snout short, 6.3 to 6.7 in head; eyes wholly superior, looking upward, 5.9 to 7.2 in head; interorbital narrow, concave, 8.6 to 10 in head; mouth nearly vertical, with labial fringes; the lower jaw strongly projecting; maxillary truncate, 2.5 to 2.9 in head; preopercle unarmed; upper angle of opercle with fringes, the lower margin with a broad membranous border; teeth pointed, not uniform in size, in very narrow bands, wanting on vomer and palatines; gill-rakers undeveloped; lateral line running near the back through 13 or 14 scales, then abruptly deflected to middle of side to base of caudal; scales moderate, cycloid, wanting on head; dorsal fin long and low, continuous, its origin a little behind base of pectorals, the spines gradually merging into the soft rays, the last rays reaching base of caudal; caudal fin very gently rounded, about as long as the postorbital part of head; anal fin long, its origin a little in advance



Cokeridia crossota gen. et sp. nov.
Drawn from the type 85 mm. in length.

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of that of dorsal and coterminal with it, the spines merging into soft rays; ventral fins jugular, inserted under or slightly in advance of preopercular margin, consisting of a very short spine and 3 rays, reaching origin of anal; pectoral fins large and broad, the third to sixth rays from above longest, equal to or longer than head, 3.9 to 4.8 in body.

Color light brown above, pale below; upper surface of head and nape with dark brown spots and more or less definite rings; numerous small dark brown spots along the back in the larger examples, the smallest specimen with indistinct quadrate blotches on back; dorsal and caudal with small dark spots; the other fins colorless.

There are 3 specimens of this species in the Panama collection, ranging in length from 56 to 112 mm. They were taken on a sandy beach at Taboga Island from May 12 to 15, 1911. One of the large specimens had attached to its abdomen a cluster of eggs containing well developed embryos which encircled the eggs and had well developed eyes with lenses. It is unlikely that the eggs were extruded under accidental pressure when the fish was caught in a minnow seine, as there was not an egg inside the specimen when dissected and the sexual organs appeared to be completly collapsd. It, therefore, is probable that this fish carries the eggs externally until hatched, although there is no special pouch provided for retaining them, the eggs being held together by gelatinous threads.

Known from the Gulf of California and now for the first time recorded from Panama Bay. Our specimens are from Taboga Island.

244. Genus **Cokeridia** gen. nov.

Type *Cokeridia crossota* sp. nov.

Body elongate, compressed; head compressed; eyes superior; mouth nearly vertical; both lips with evident fringes; teeth in jaws in bands; lateral line descending abruptly, the dorsal portion much shorter than the median one; a separate dorsal fin at nape, composed of 4 short well separated spines. This genus bears some relationship to *Gillellus*, especially in the presence of a separate spinous dorsal fin.

The genus is named for Dr. Robert E. Coker, professor of biology with the University of North Carolina, formerly chief of the Division of Scientific Inquiry, U. S. Bureau of Fisheries, to whom we are indebted for many suggestions and for encouragement while this work was in the course of preparation.

663. Cokeridia crossota sp. nov. (Plate LXXXIX.)

Type No. 81784, U. S. N. M.; length 85 mm.; Chame Point, Panama.

Head 4.7; depth 5.5; D. IV-VIII-26; A. II, 30; scales 40.

Body elongate, compressed, tapering toward the tail; head rather deep, compressed; snout very short, 11 in head; eyes small, superior, 8.3; interorbital narrow, 13; mouth nearly vertical, rather small maxillary broad, 3 in head; lips with fringes, the median ones on upper lip very short; teeth in the jaws small, in bands; upper part of opercular margin with fringes, 14 or 15 in number; origin of lateral line at upper anterior angle of gill-opening, running slightly upward and backward anteriorly on 9 or 10 scales, curving abruptly downward to median line of side under tip of pectoral; scales moderate, very thin, cycloid; origin of dorsal slightly behind vertical from preopercular margin, preceded by 4 short, separate spines, not exceeding in length the diameter of eye and separated from each other by spaces slightly greater than the length of the spines, the rest of the fin consisting of two separate parts, 8 connected inarticulated rays and 26 articulated rays; caudal fin separated from the dorsal and anal by a very short peduncle, the fin round; anal fin similar to dorsal, the first 2 rays inarticulated; ventral fins inserted in advance of base of pectorals, consisting of 3 connected rays; pectoral fins broad at base, the upper and lower rays short, the median ones longest, 1.2 in head.

Color in alcohol pale brownish, with dark brown punctulations on sides, most numerous and darkest above lateral line; back of head and body with quadrate dark brown spots, largest on head and diminishing in size posteriorly, the last one a small dark spot at base of upper rays of caudal; fins all pale, the dorsal with dark spots on base of rays.

A single specimen, 85 mm. long, was obtained at Chame Point and it represents the type of a new genus and species.

Family LXXVIII. **Uranoscopidæ.**

THE STAR-GAZERS.

Body elongate, conic, more or less compressed, widest and usually deepest at occiput; head large, broad, partly covered with bony plates; eyes small, superior, placed anteriorly; mouth vertical; teeth moderate, present on jaws, vomer and palatines; premaxillary protractile; maxillary broad, without a supplemental bone; gill-openings wide; gill-membranes nearly separate, free from the isthmus; gills 3½, a slit behind the last; pseudobranchiæ present; branchiostegals 6; scales, if present, small; spinous dorsal small or wanting, the soft dorsal long; caudal fin not forked; anal fin large; ventral fins jugular, close together, with I, 5 rays; pectoral fins large, broad, with oblique bases, the lower rays rapidly decreasing in length. Two genera of this family come within the scope of the present work.

KEY TO THE GENERA.

a. Spinous dorsal present, consisting of 4 or 5 well developed, pungent spines; scales well developed in adult. *Astroscopus*, p. 907.

aa. Spinous dorsal obsolete; scales wanting. *Kathetostoma*, p. 909.

245. Genus **Astroscopus** Brevoort.

Astroscopus Brevoort, in Gill, Proc. Ac. Nat. Sci. Phila., 1860, 20 (type *Uranoscopus anoplos* Cuvier & Valenciennes).

Agnus Günther, Cat. Fish. Brit. Mus., II, 1860, 229 (type *Uranoscopus anoplos* Cuvier & Valenciennes).

Upselonphorus Gill, Proc. Ac. Nat. Sci. Phila., 1861, 113 (type *Uranoscopus y-græcum* Cuvier & Valenciennes).

Body robust; upper surface of head not entirely covered with bone, the occipital plate ceasing far behind eyes; a bony Y-shaped process on head, the forks of the Y reaching forward to interorbital, the vertical limb extending backward to occipital plate; the area between the forks of the Y and extending forward to upper lip covered by naked skin; a somewhat triangular naked area present on each side of the Y serving as a covering for the electric organs; head without spines in the adult; young individuals with the head largely covered with bone and with spines; anterior nostril round, situated in front of eye, fringed; posterior nostril represented externally as a crescent-shaped groove, terminating behind eye, fringed; lips fringed; back and sides covered with close-set scales in adult; first dorsal with 4 or 5 short pungent spines, connected with the long soft dorsal by membrane.

664. **Astroscopus zephyreus** Gilbert & Starks.

Astroscopus zephyreus Gilbert & Starks, in Gilbert, Proc. U. S. Nat. Mus., 1896, 453, Pl. LIII, fig. 2 & Pl. LIV (Magdalena Bay, L. C.); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2309.

Head 2.86; depth 4; D. V, 14; A. 12; scales about 89.

Body robust, subcylindrical anteriorly, compressed posteriorly; head large, depressed, broader than deep; snout short, 5.3 in head; eyes small, superior, 12; interorbital broad, 3.35; mouth large, vertical, the lower jaw much in advance of the upper; the lips with fringes, some of them longer than eye; maxillary very broad, 2.25 in head; anterior nostril round, fringed, the posterior nostril long, crescent-shaped, curved abruptly forward posteriorly; the forked portion of the Y on the head shorter than the vertical limb; a large naked area between the forks, and larger naked triangular areas over the electric organs situated behind the elongate posterior nostrils and along sides of the Y; head entirely scaleless, but with coarsely rugose areas; belly naked below a line drawn from the origin of the anal to middle of base of pectoral; the median line of belly with a prominent membranous fold; the rest of body with small and nearly square scales, grown together and forming oblique plates, running downward and backward; fins all naked; dorsal fins separate; origin of first dorsal somewhat nearer tip of snout than end of base of dorsal, the soft fin much higher than the spines; caudal fin broadly rounded; anal fin similar to the soft dorsal but scarcely as high; ventral fins inserted in advance of pectorals, nearly at symphysis of the isthmus, reaching nearly to end of base of pectorals, the inner rays much the longest; pectoral fins with broad bases, the lower rays short, graduated, the upper rays longest, reaching a little beyond origin of soft dorsal.

Color brownish above, paler below; upper parts with many small white spots, edged with dark brown; spinous dorsal black; soft dorsal pale brownish at base anteriorly, with alternating black and pale brown vertical bands; caudal fin with alternating brownish and black longitudinal bars; anal and pectorals nearly uniform dark brown; ventral fins pale, with few dusky punctulations and an elongate black spot on the membrane between the first and second inner rays near the tip of fins.

Two specimens of this species, 36 and 300 mm. in length, are at hand. The above description is based on the large specimen, from which the smaller specimen differs so greatly that it appears advisable to mention the differences which quite certainly are due only to age. We would have been unable to identify the small specimen with the larger one with any degree of certainty, had we not had the opportunity of examining a large series, including various sizes, of the more common form, *A. y-græcum,* of the Atlantic coast of our southern states, which undergoes similar changes with age. The small specimen is proportionately much more robust than the large one, the depth being contained 2.7 in the length; the eyes are proportionately very much larger, 5.5 in head; the Y on the head is undeveloped; the naked areas where the electric organs are situated are not present; a high bony ridge lies near the eye and the elongate posterior nostril is situated between this bony ridge and the orbit, running very close to the orbit posteriorly, whereas in the adult it is somewhat distant from the orbit posteriorly; there are 2 blunt spines at occiput and one on each shoulder at upper angle of gill-opening; an evident pore is present at the base of each spine on occiput; scales apparently are entirely wanting. The color is uniform blackish above, the belly and lower parts of head pale; the spinous dorsal is black, and the other fins are colorless.

Known from the Pacific coast of Mexico; apparently rather rare. Previously not recorded from Panama. The specimens at hand were taken at Chame Point by Mr. Robert Tweedlie.

246. Genus **Kathetostoma** Günther.

Kathetostoma Günther, Cat. Fish. Brit. Mus., II, 1860, 231 (type *Uranoscopus lævis* Bloch & Schneider).

Body robust, formed as in *Astroscopus* and *Uranoscopus;* some of the bones of head armed; gill-cavity without superior opening; scales wanting; pseudobranchiæ present; branchiostegals 6; air bladder wanting; dorsal fin continuous, without spines; ventrals jugular, not adnate to abdomen; pectoral rays branched. A single species is known from Panama waters.

665. **Kathetostoma averruncus** Jordan & Bollman.

Kathetostoma averruncus Jordan & Bollman, Proc. U. S. Nat. Mus., 1889, 163 (Albatross Station 2800, Panama Bay, 7 fathoms); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2311; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 181.

Head 2.66; depth 3.75; D. 13; A. 13.

Body short and robust, its width behind base of pectorals equal to length of top of head; head very large; snout 1.4 in eye; eye rather small, 5 in head; mouth large, vertical; maxillary 2 in head; teeth of lower jaw largest, inner row of each jaw enlarged and movable; vomer and palatines with a few large, conical teeth; lower jaw without tentacle; preorbital with 3 spines in front, directed forward and downward; preopercle with 3 spines below angle, directed forward and downward; mandible with 2 antrose spines and two spines on chest before ventrals; top of head coarsely granular; occipital region with radiating ridges, starting from 2 points; base of dorsal and anal of equal length, 1.4 in head; ventral fins reaching more than half way to vent, equal to length of top of head; pectorals half the diameter of the eye longer than the ventrals.

Color blackish brown, mottled with paler; lower parts pale, dusted with brown; lips and gular region black; dorsal dusky, with 5 indistinct, partly confluent, whitish spots along the base; caudal with 3 irregular dark bars; anal anteriorly pale, posteriorly thickly dusted with blackish, the tips of rays pale; ventrals pale; pectorals blackish, faintly barred, the axil dusted outside, inner parts very pale.

Known only from the Pacific coast of Panama from a single specimen, 120 mm. long, dredged at a depth of 7 fathoms, by the "Albatross." Not seen by us.

Family LXXIV. **Batrachoididæ.**

THE TOAD-FISHES.

Body depressed anteriorly, compressed posteriorly; head large, depressed; mouth large; teeth usually strong; premaxillaries protractile; gills 3, a slit between the last; gill-openings restricted to the side, the membranes broadly united to the isthmus; pseudobranchiæ none; branchiostegals usually 6; gill-rakers present, moderate; suborbital without a bony stay; post-temporal bone simple, undivided; scales small or wanting; dorsal fins 2, the first with 2 or 3 low, strong spines; soft dorsal long and low; anal similar, but shorter; pectorals broad, at least at base; caudal fin rounded; vertebræ 32 to 45.

KEY TO THE GENERA.

a. Dorsal spines 3; opercle with 2 strong diverging spines; subopercle with one or two stiff spines.

b. Body covered with small striated scales; subopercular spines 2, strong and diverging, similar to opercular spines. *Batrachoides,* p. 911.

bb. Body scaleless; subopercle with only one strong spine.

c. Axil of pectoral with a prominent foramen. *Opsanus,* p. 917.

cc. Axil of pectoral without a foramen, but with numerous glandular folds. *Amphichthys,* p. 918.

aa. Dorsal spines 2; opercle with a single strong spine; subopercle feebly developed, without a spine; body scaleless.

d. Opercular and dorsal spines hollow, connected at base with venom glands; lateral line single; no canine teeth. *Thalassophryne,* p. 919.

dd. Opercular and dorsal spines solid, not connected with venom glands; lateral lines 4; some of the teeth canine-like. *Porichthys,* p. 922.

247. Genus **Batrachoides** Lacépède.

Batrachoides Lacépède, Hist. Nat. Poiss., II, 1800, 451 (type *Batrachoides tau* Lacépède).

Batrachus Bloch & Schneider, Syst. Ichth., 1801, 42 (type *Batrachus surinamensis* Bloch & Schneider).

Batrichtius Rafinesque, Analyse Nat., etc., 1815, 82 (substitute for *Batrachoides*).

Body subcylindrical anteriorly, compressed posteriorly; head broad, strongly depressed; pores about mouth and in lateral line accompanied by dermal flaps and fringes; dorsal spines 3; opercle and subopercle each with 2 solid diverging spines; no poison glands; body covered with small striated scales, more or less embedded, at least anteriorly.

KEY TO THE SPECIES.

a. Dorsal with III-24 to 26 rays; anal with 21 to 23 rays.

b. A conspicuous glandular pocket in axil of pectoral; vomerine, palatine and lateral mandibular teeth very strong and blunt; vomerine teeth in a single row. *pacifici*, p. 912.

bb. Axil of pectoral without a glandular pocket; vomerine, palatine and lateral mandibular teeth moderate, or rather small and pointed.

c. Eye rather large, 2.1 in interorbital space in specimens 265 mm. in length; lower jaw strongly projecting, exposing the teeth near mandibular symphysis when the mouth is closed; vomerine teeth in 2 rows; outer teeth at mandibular symphysis enlarged; a distinct pore at base of each interradial membrane of pectoral on inner side of fin, these continued on fin as canals. *goldmani*, p. 913.

cc. Eye small, 3 in interorbital space in specimens 265 mm. in length; lower jaw only slightly projecting, none of the teeth exposed when the mouth is closed; vomerine teeth in a single row; outer teeth at mandibular symphysis not enlarged; a small pore at base of only the upper interradial membranes of pectoral on inside of fin, these not extended on fin as canals. *gilberti* sp. nov., p. 914.

aa. Dorsal with III-28 or 29 rays; anal with 25 or 26 rays.

d. Pores present at base only of the upper interradial membranes of pectoral on inner side of fin; scales extending forward to a line connecting posterior end of maxillaries; cirri about mouth numerous; upper lateral line interrupted slightly behind middle of base of dorsal, reappearing on extreme base of this fin, there forming 11 or 12 pores; fins with dark and whitish bars and streaks. *surinamensis,* p. 915.

dd. A conspicuous pore present at base of each interradial membrane of pectoral on inner side of fin; scales extending forward to a line connecting the base of upper opercular spines; cirri about mouth rather few; upper lateral line interrupted at beginning of posterior third of base of dorsal, reappearing on the extreme base of this fin, there forming 7 or 8 pores; fins plain, of the same color as the body. *boulengeri,* p. 916.

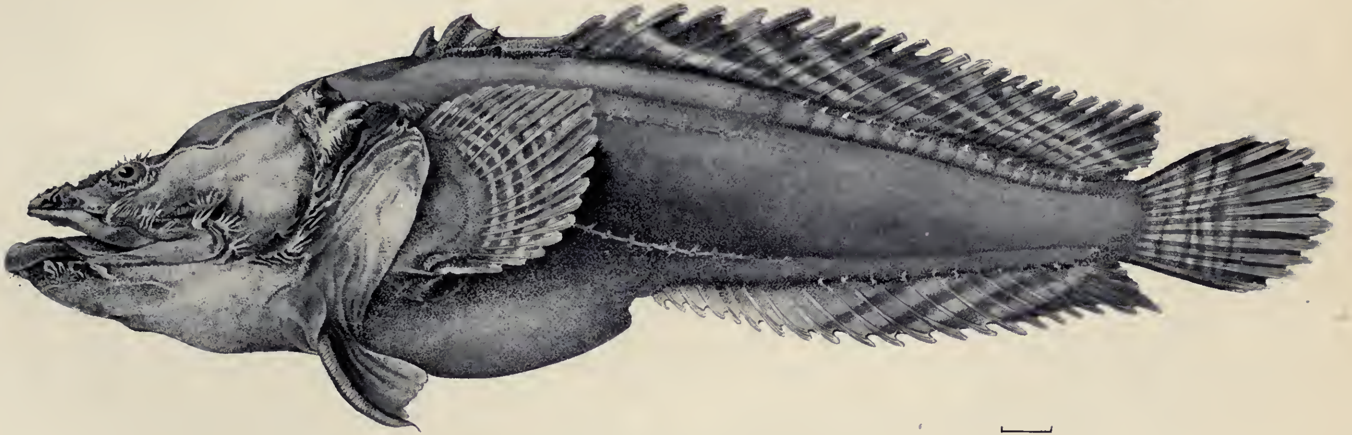
666. Batrachoides pacifici (Günther).

Batrachus pacifici Günther, Cat. Fish. Brit. Mus., III, 1861, 173 (Panama).

Batrachoides pacifici Gill, Proc. Ac. Nat. Sci. Phila., 1863, 170; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2314; Gilbert & Starks, Memoir. Cal. Acad. Sci., IV, 1904, 181 (Panama); Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 159; Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 412 (Panama).

Head 2.7 to 3; depth 4.8 to 6.6; D. III-25 or 26; A. 21 or 22.

Body elongate; head strongly depressed, its width 1.06 to 1.2 in its length; snout very broad, 3.9 to 5 in head; eye larger than in related species, 1.7 to 2.4 in interorbital space, 4.3 to 8 in head; lower jaw projecting; mouth large, the maxillary reaching past eye, 1.35 to 1.75 in head; opercle and subopercle each with 2 strong, diverging spines; premaxillary teeth in a narrow villiform band tapering laterally to a point; strong conical canine-like teeth on vomer, palatine and laterally on mandible, those near mandibular symphysis in a broad cardiform patch, with the outer ones enlarged; head and chest naked, the rest of the body covered with small, partly embedded, cycloid scales; lateral lines 2; the upper one on a level with the upper opercular spine, interrupted slightly anterior to middle of base of dorsal, reappearing along the base of the dorsal, again interrupted near the last rays of the fin, then assuming its former level on the caudal peduncle; the lower lateral line curving upward around the base of pectorals, interrupted at about the beginning of the second third of the base of the anal, and again posteriorly, similar to the upper one; the interruption of these lateral lines not always very evident, sometimes with intermediate pore, then being curved rather than interrupted; alimentary canal much shorter than body; air bladder short and broad, divided into 2 compartments by a longitudinal partition; dorsal fins separate, the first with 3 strong spines; the spines flattened, with a cutting edge;



BATRACHOIDES GILBERTI sp. nov.
Drawn from the type 270 mm. in length.

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pectorals broad, with a conspicuous, glandular pocket in axil, interradial membranes each with a conspicuous pore at the base on inner side of fin, these pores continued on fin as canals.

Color of adult examples nearly uniform dark brown above, paler below; the young with evident dark cross-bars; fins with more or less distinct whitish bars and margins of the same color.

This species is represented by 32 specimens, ranging in length from 28 to 340 mm. None of our examples retains the sucking disk which the young are said to have.

Known from Panama to Ecuador. Our specimens are from Chame Point; Balboa; tide pools, Panama; and the Panama City market; mostly taken on rocky bottom; common in tide pools.

667. **Batrachoides goldmani** Evermann & Goldsborough.

Batrachoides goldmani Evermann & Goldsborough, Bull. U. S. Fish Comm., XXI, 1901 (1902), 159, fig. 8 (Tabasco, Mexico).

Head 2.8; depth 5.75; D. III-24; A. 21.

Body elongate; head strongly depressed, its width 1.3 in its length; snout rather broad, 4.5 in head; eye rather large, 2.1 in interorbital space, 6.4 in head; lower jaw strongly projecting, outer mandibular teeth exposed when mouth is closed; mouth large; the maxillary reaching past eye, 1.65 in head; opercle and subopercle each with 2 diverging spines; teeth slender and more sharply pointed than in related species; premaxillary teeth in a rather broad villiform band; vomerine teeth in 2 irregular rows, those on inner row the larger; palatine and lateral mandibular teeth in a single row and irregular in size; a broad patch of cardiform teeth, the outer ones near mandibular symphysis enlarged; head and chest naked, the rest of the body covered with small, striated scales, embedded anteriorly only; lateral lines 2, indistinct, only the anterior pores accompanied by cirri, their position as in *B. pacifici;* the upper line interrupted near the beginning of the posterior third of base of dorsal, and the lower opposite the posterior third of anal, reappearing, respectively, on the extreme base of the dorsal and anal, there forming only a few pores, then each reassuming its former level on caudal peduncle; dorsal fins separate, the first with 3 stiff spines, the spines not notably flattened and without a cutting edge; pectorals broad, without a glandular pocket in axil, each interradial membrane with a conspicuous pore at its base on inner side of fin, these pores continued on the fin as canals.

Color grayish, with irregular dark cross-bars, besides other irregular dark spots and blotches; pectorals with alternating brownish and whitish bars; dorsal and anal with indistinct oblique streaks of the same color; caudal almost uniformly brown, with a black bar at base.

The above description is based on the type, a specimen 265 mm. in length, from Rio Usumachinta, Tabasco, Mexico, taken by Nelson and Goldman. In the original description the number of anal rays is given as 18. This is an evident error, as we are able to count 21. The eye is given as 9 in head, but we find that it is contained only 6.4 in head.

668. **Batrachoides gilberti** sp. nov. (Plate XC.)

Type No. 81002, U. S. N. M.; length 270 mm.; creek opposite Mindi Cut, Canal Zone.

Head 2.75 to 2.95; depth 3.8 to 5.2; D. III-25 or 26; A. 22 or 23. Body elongate; head strongly depressed, its width 1.15 to 1.45 in its length; snout short and broad, 4.1 to 4.85 in head; eye rather small, 1.9 to 3.1 in interorbital space, 7.3 to 10 in head; lower jaw projecting only slightly, none of the mandibular teeth exposed when mouth is closed; mouth large, the maxillary reaching much beyond eye, 1.6 to 1.9 in head; opercle and subopercle each with 2 strong diverging spines; teeth as in *B. pacifici,* only the conical canines being much smaller, and the outer teeth of the patch near mandibular symphysis not enlarged; head and chest naked, the rest of the body covered with small, partly embedded, striated scales; lateral lines 2, broken up into separate pores, not forming continuous lines; the upper one on a level with upper opercular spine, interrupted notably in advance of middle of base of dorsal, then running along the extreme base of this fin to near the last ray, then reassuming its former level on caudal peduncle; the lower line curved upward back of base of pectoral and interrupted near the beginning of the second third of the base of anal, thence running along the base of this fin to near the last rays, then reassuming its former level; alimentary canal much shorter than body; stomach with heavy muscular walls; air bladder short and broad, divided into 2 compartments by a longitudinal partition; dorsal fins separate, the first with 3 strong spines, the spines not notably flattened and without a cutting edge; pectoral broad, without an evident glandular pocket in the axil, only the upper half of interradial membranes with pores at their bases on inner side of fin, these pores not extended on fin as canals.

Color of large examples nearly uniform brown above, paler below; young with dark cross-bars; pectoral and caudal with more or less distinct, alternating bars of black and white; dorsal and anal with oblique streaks of the same color.

Only 6 specimens of this species, ranging from 140 to 270 mm. in length, were secured. These were all taken on the same date at the mouth of a small brackish stream flowing into the French Canal, near Mindi Cut.

669. Batrachoides surinamensis (Bloch & Schneider).

Batrachoides tau Lacépède, Hist. Nat. Poiss., II, 1800, 451 (not *Gadus tau* Linnæus).

Batrachus surinamensis Bloch & Schneider, Syst. Ichth., 1801, 43 (Surinam).

Batrachoides surinamensis Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2314 (in part); Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 183; Starks, Leland Stanford Jr. Univ. Pub., Univ. Ser., 1913, 71; Fowler, Proc. Ac. Nat. Sci. Phila., 1917, 136 (Colon).

Head 3 to 3.2; depth 5.5 to 5.85; D. III-28 or 29; A. 25 or 26.

Body elongate; head strongly depressed, its width 1.18 to 1.3 in its length; snout very broad, 4.1 to 5 in head; eye small, 2.6 to 4 in interorbital space, 6.6 to 10 in head; lower jaw projecting; mouth large, the maxillary reaching much beyond eye, 1.6 to 1.9 in head; opercle and subopercle each with 2 strong diverging spines; teeth as in *B. pacifici,* but having the conical canines smaller; one specimen at hand has the vomerine teeth partly in a double series; anterior portion of head from vertical of posterior end of maxillary naked, in the large specimen at hand the chest also naked, rest of body covered with small striated scales, embedded on anterior portion of body only; lateral lines 2, forming continuous lines anteriorly, not broken up into separate pores; the upper one slightly above the level of the upper opercular spine, and interrupted slightly behind the middle of base of dorsal, reappearing on the extreme base of dorsal, there forming 11 or 12 pores, again interrupted near the last rays of the dorsal, then assuming its former level on caudal peduncle; the lower line curved upward back of base of pectorals, interrupted (in one specimen it curves downward) slightly anterior to middle of base of anal, then running along the base of this fin to opposite the last rays, then reassuming its former level; dorsal fins separate, the anterior with 3 stiff spines, the spines not notably flattened and without a cutting edge; pectoral broad, with an evident glandular pocket in the axil, only the interradial membranes of upper half of fin with evident pores at the base of rays on inner side of fin.

Body mostly plain brown in spirits; pectorals and caudal with more or less distinct alternating whitish and dark cross-bars; dorsal and anal with oblique streaks or bars of the same color.

This species was not taken by us. It is here described from 2 specimens, respectively 155 and 340 mm. in length. The largest one, U. S. N. M. No. 9368, is from Rio Truando, Colombia, and the smaller one, U. S. N. M. No. 26646, from Curuca, Brazil.

Known from Colon southward to Brazil.

670. Batrachoides boulengeri Gilbert & Starks.

Batrachus surinamensis Günther, Cat. Fish. Brit. Mus., III, 1861, 174 (in part); Günther, Trans. Zoöl. Soc. London, VI, 1869, 388 (not of Bloch & Schneider).

Batrachoides surinamensis Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2314 (in part).

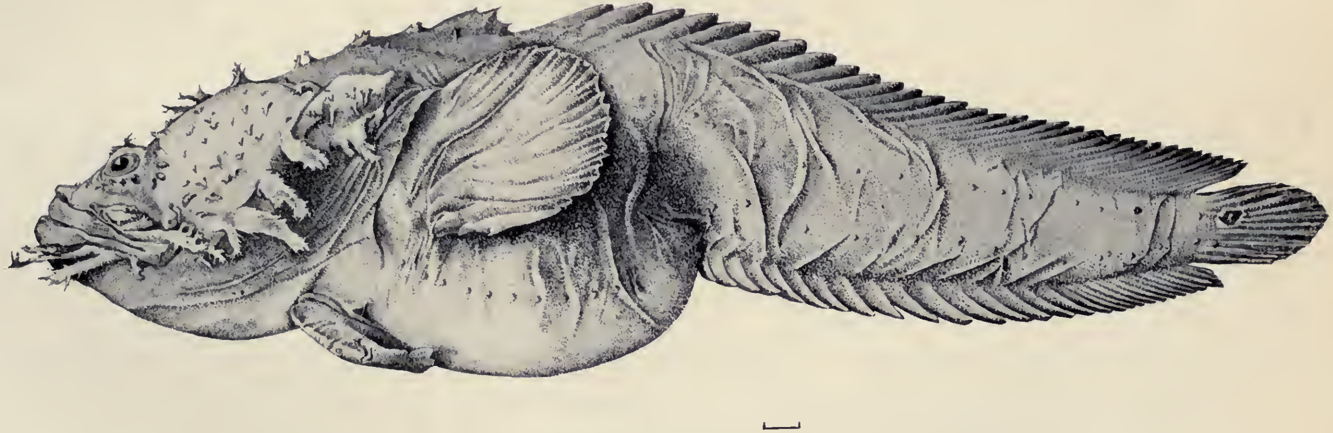
Batrachoides boulengeri Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 182 (Panama Bay).

Head 2.9 to 3.2; depth 4.7 to 6; D. III-28 or 29; A. 25 or 26.

Body elongate; head very strongly depressed, its width 1.03 to 1.1 in its length; snout very broad, 4.2 to 4.9 in head; eye small, 4.2 to 5.4 in interorbital space, 10 to 14.5 in head; lower jaw projecting; mouth large, the maxillary reaching much beyond eye, 1.47 to 1.65 in head; opercle and subopercle each with 2 strong, diverging spines; teeth as in *B. pacifici,* the conical canines scarcely as large and strong; head and chest naked, the rest of the body covered with small, partly embedded, striated scales; lateral lines 2, their position as in *B. pacifici;* the upper line interrupted at the beginning of the posterior third of base of dorsal, then running along the base of the dorsal for a very short distance, forming only 7 or 8 pores, then reappearing at its former level on caudal peduncle; the lower line interrupted slightly in advance of the middle of the base of anal, and again posteriorly similar to the upper one; dorsal fins separate, the first with 3 strong spines, all somewhat flattened, with a cutting edge; pectoral broad, without an evident glandular pocket in axil, each interradial membrane with a pore at its base on inner side of fin, these pores extending as canals on the fin.

Color dark brown above, with indistinct dark cross-bars; paler below; fins all of the same color as the body.

This species is represented by 4 specimens in the present collection, ranging from 355 to 400 mm. in length.



OPSANUS BARBATUS sp. nov.
Drawn from the type 390 mm. in length.

This fish when captured fights vigorously, not only using its sharp dorsal, opercular, and subopercular spines, but snapping at anything coming near it. When the writers found it almost impossible to pick this fish up with the hand, its habit of snapping was taken advantage of by giving it a stick to catch with its teeth, which it held so tightly that it in this way could be very easily transferred to the collecting can.

With the material at hand it is difficult to find characters upon which to separate this species from the Atlantic representative, *B. surinamensis.* Only a few minor differences were noted, and these may prove to be only individual variations when a larger series can be compared. More specimens from each coast are much desired.

Known only from the Pacific coast of Panama. Our specimens are from tide streams at Corozal and from the Panama City market.

248. Genus **Opsanus** Rafinesque.

Opsanus Rafinesque, Amer. Monthly Mag., II, 1818, 203 (type *Opsanus cerapalus* Rafinesque = *Gadus tau* Linnæus).

Body subcylindrical anteriorly, compressed posteriorly; head broad, strongly depressed; dorsal spines 3; opercle with 2 diverging spines, subopercle with one strong spine only, these spines hidden in the skin; no poison glands; body naked; axil of pectoral with a conspicuous foramen.

671. **Opsanus barbatus** sp. nov.* (Plate XCI).

Type No. 81009, U. S. N. M.; length 390 mm.; Colon Reef.

Head 3.25; depth 4.1; D. III-32; A. 27.

Body robust anteriorly, subcylindrical, strongly compressed posteriorly; head much depressed, its width nearly as great as its length; eye moderate, 1.35 in interorbital space, 5.5 in head; a small cirrus on its inner posterior margin; snout rather narrow, tapering, 4.7 in head; lower jaw projecting; a row of long fringed dermal flaps on margin of chin, another prominent row beginning below eye and extending to subopercular spine, besides numerous smaller cirri on head and predorsal region; mouth moderate, the maxillary reaching posterior margin of eye, 1.85 in head; opercle with 2 strong diverging spines, subopercle with one spine, these spines hidden in the skin; premaxillary teeth small, in 2 irregular rows; small conical canine teeth

*Since this description was written, C. M. Breder, Jr., (Amer. Mus. Novit., No. 188, 1925, pp. 1 and 2, fig. 1) has described another new species, *Opsanus hildebrandi,* which was obtained in the Colon market.

present on vomer, palatine and mandible, those on vomer and near mandibular symphysis in 2 rows; body naked; lateral lines 2, continuous, each pore accompanied by cirri; dorsal fins separate, the first composed of 3 strong spines, hidden in the skin, the second long and low, the rays much enveloped in the loose skin of the body and difficult to enumerate; anal long and very low, the anterior rays mostly separate; pectorals short and broad, a prominent foramen in axil; no pores at base of interradial membranes.

Color uniform brown above, paler below; base of caudal with one black ocellus on one side and 3 on the other, fins otherwise of uniform coloration like the body.

Our only specimen, 390 mm. long, was taken on the Colon Reef. It differs from *O. tau* chiefly in the longer and much lower vertical fins, smaller teeth, the more numerous and much longer cirri on head and predorsal region, and in the uniform coloration.

249. Genus **Amphichthys** Swainson.

Amphichthys Swainson, Nat. Hist. & Class. Fish., II, 1839, 282 (type *Batrachus rubigenes* Swainson).

Marcgravia Jordan, Proc. U. S. Nat. Mus., 1886, 546 (type *Batrachus cryptocentrus* Cuvier & Valenciennes).

Marcgravicthys Ribeiro, Arch. Mus. Nac. Rio de Janeiro, XVII, 1915, 3 (type *Batrachus cryptocentrus* Cuvier & Valenciennes).

Body subcylindrical anteriorly, compressed posteriorly; head broad, strongly depressed; dorsal spines 3; opercle with 2 diverging spines, subopercle with one spine only, these spines hidden in the skin; no poison glands; body naked; axil of pectoral without a foramen, but with numerous glandular folds of skin.

672. Amphichthys cryptocentrus (Cuvier & Valenciennes).

Batrachus cryptocentrus Cuvier & Valenciennes, Hist. Nat. Poiss., XII, 1837, 485 (Bahia, Brazil).

Batrachus tau cryptocentrus Meek & Hall, Proc. Ac. Nat. Sci. Phila., 1885, 60.

Marcgravia cryptocentra Jordan, Proc. U. S. Nat. Mus., 1886, 546.

Head 2.85 to 3.15; depth 4.1 to 5.3; D. III-28 or 29; A. 24 or 25.

Body elongate; head strongly depressed, its width 1.04 to 1.15 in its length; snout rather narrow, 4.8 to 5.3 in head; eye large, its longest diameter about equal to interorbital width, 4.6 to 5.5 in head; a prominent cirrus on its inner posterior margin; lower jaw projecting; mouth moderate; the maxillary reaching posterior margin of eye, 1.8 to 1.95

in head; opercle with 2 strong diverging spines; subopercle with one spine; premaxillary teeth in a very narrow villiform band, reduced to a single row laterally; vomerine, palatine and mandibular teeth strong and very blunt, an outer row of smaller teeth near mandibular symphysis; body naked; lateral lines 2, continued to opposite the last ray of dorsal and anal respectively, each pore accompanied by 2 dermal flaps; dorsal fins separate, the first with 3 spines, partly hidden in the skin; pectorals broad, axil covered with numerous glandular folds, but without a foramen.

Color dark brown above, paler below; young with evident dark cross-bars; chin and chest often indistinctly reticulated with whitish lines; each pore in lower lateral line in a white spot; fins plain, with narrow white margins.

Of this species 5 specimens, ranging from 180 to 320 mm. in length, were secured.

Heretofore known only from Brazil. Our specimens are from the Colon market, Colon Reef and Fox Bay, Colon; mostly taken on rocky bottom.

250. Genus **Thalassophryne** Günther.

Thalassophryne Günther, Cat. Fish. Brit. Mus., III, 1861, 174 (type *Thalassophryne maculosa* Günther).

Dæctor Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2325 (type *Thalassophryne dowi* Jordan & Gilbert).

Body elongate; head depressed; lower jaw projecting; opercle with a strong hollow spine; subopercle feebly developed, not ending in a spine; teeth conic or incisor-like, no canines; body without scales; lateral line single; dorsal spines 2, hollow, and like the opercular spines, connected with venom glands; pectorals broad, without foramen in axil.

KEY TO THE SPECIES.

a. Dorsal and anal long, each with 25 rays or more; teeth conic, or slightly flattened at tips.

b. Head much wider than deep, its length 2.8 to 3.2 in body; dorsal and anal free from caudal, the former with II-26 to 28 rays, the latter with 25 or 26 rays; body and fins with conspicuous reticulations of whitish lines. *reticulata*, p. 920.

bb. Head scarcely wider than deep, its length 3.6 to 3.8 in body; dorsal and anal joined to caudal, the former with II-30 to 32 rays, the latter with 29 or 30 rays; body without reticulations, mostly dark brown or black above, pale below. *dowi*, p. 920.

aa. Dorsal and anal of moderate length, free from caudal, the former with II-18 rays and the latter with 17 rays; teeth broad, incisor-like. *megalops*, p. 921.

673. Thalassophryne reticulata Günther.

Thalassophryne reticulata Günther, Proc. Zoöl. Soc. London, 1864, 150 & 155 (Panama); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2325; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 186 (Panama); Bean & Weed, Proc. U. S. Nat. Mus., 1911, 522.

Head 2.8 to 3.2; depth 4.4 to 6.1; D. II-26 to 28; A. 25 or 26.

Body elongate, compressed; head depressed, much wider than deep, its width 1.05 to 1.15 in its length; snout very broad, and not much longer than eye, its edge with several dermal flaps; eye small, wholly superior, 9.7 to 11 in head; mouth very wide; lower jaw strongly projecting; maxillary reaching posterior margin of eye, 2.3 to 2.5 in head; opercle with a single, stiff, hollow spine; teeth present on both jaws, vomer and palatines, conic, more or less flattened at tips; body naked; head with short cirri above; lateral line single, receiving several short side branches on head; dorsal fins separate, the first with 2 hollow spines; the second dorsal long and low, free from the caudal; caudal fin rounded; anal similar to second dorsal, and free from caudal; pectorals reaching past origin of anal, 1 to 1.15 in head.

Color dark gray, with reticulations of whitish lines, the reticulations smaller anteriorly than posteriorly; chest and abdomen pale; spinous dorsal black; other fins mostly with reticulations similar to body, their margins pale.

Of this species we have 8 specimens, ranging from 50 to 300 mm. in length.

Known only from Panama Bay. Our specimens are from Balboa and Panama.

674. Thalassophryne dowi Jordan & Gilbert.

Thalassophryne dowi Jordan & Gilbert, Proc. U. S. Nat. Mus., 1887, 388 (Punta Arenas); Gilbert & Starks, Memoir. Cal. Ac. Nat. Sci., IV, 1904, 187 (Panama); Bean & Weed, Proc. U. S. Nat. Mus., 1911, 514.

Dœctor dowi Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2325.

Head 3.6 to 3.8; depth 4.8 to 5.75; D. II-30 to 32; A. 29 or 30.

Body elongate, compressed; head depressed, slightly wider than deep, its width 1.2 to 1.4 in its length; snout very broad, and not much longer than eye, with 4 short barbels on edge behind premaxillary; eyes very small, wholly superior, 10 to 11.5 in head; mouth very wide, the gape much wider than deep; lower jaw strongly projecting; maxillary reaching beyond eye, 2.25 to 2.5 in head; opercle not greatly developed, with a strong hollow spine; teeth present on both jaws and on palatines, the latter the largest, conic, some of them slightly canine-like; body naked; lateral line single, lying close to the back; dorsal fins separate, the first composed of 2 short hollow spines; second dorsal long and low, joined to the caudal; caudal round; anal similar to second dorsal, joined to caudal; pectorals wide, 1.3 to 1.55 in head.

Color dark brown or black above, with more or less white irregularly intermixed; white below; lateral line in a pale streak; spinous dorsal black; soft dorsal and caudal pale at base, with bluish black margin; posterior rays of anal usually with a dark margin, fin otherwise pale; ventrals pale; pectorals more or less dusky at base.

The present collection contains 5 specimens, ranging in length from 130 to 160 mm. Besides these we have examined 3 specimens from the National Museum collection which range from 105 to 125 mm. in length, taken by the Albatross in Panama Bay.

Known from Punta Arenas to Panama Bay. Our specimens are from Chame Point and Balboa. Two of the Balboa specimens were seined along a sandy beach, and one was taken in a muddy tide stream. The species apparently is rare.

675. **Thalassophryne megalops** Bean & Weed.

Thalassophryne megalops Bean & Weed, Proc. U. S. Nat. Mus., 1911, 523 (Gulf of Darien).

Head 2.5 to 2.6; depth 3.6 to 3.9; D. II-18; A. 17.

Body rather robust; head large, strongly depressed, much wider than deep, its width 1.15 to 1.18 in its length; eye small, superior, 5.35 to 5.7 in head; snout broad, not longer than eye, with 2 prominent dermal flaps at its tip back of premaxillary; mouth large, oblique; lower jaw strongly projecting; maxillary reaching posterior margin of eye, 2 to 2.3 in head; opercle with a single, stiff, hollow spine; broad, flat, incisor-like teeth present on both jaws, vomer, and palatines; body scaleless; head without cirri above; lateral line indistinct; dorsal fins separate, the first with 2 hollow spines; the second of moderate length, free from caudal; caudal fin rounded; anal similar to second dorsal, free from caudal; pectorals reaching past origin of anal, 1.45 to 1.5 in head.

Preserved specimens at hand colorless, except for some black at base of spinous dorsal.

This species was not taken by us. The above description is based on the only specimens known, the type 66 mm. long and the paratype 51 mm. long, both dredged by the Albatross in the Gulf of Darien, in 45 fathoms of water.

251. Genus **Porichthys** Girard.

Porichthys Girard, Proc. Ac. Nat. Sci. Phila., 1854, 141 (type *Porichthys notatus* Girard).

Nautopædium Jordan, Proc. Ac. Nat. Sci. Phila., 1918 (1919), 342 (type *Porichthys plectrodon* Jordan & Gilbert = *Batrachus porosissimus* Cuvier & Valenciennes).

Body elongate; head depressed; the lower jaw projecting; opercle small, with a strong, solid spine; subopercle feebly developed, without a spine; canine teeth present, sometimes very small; branchiostegals 6; body without scales; several rows of pores and spots on head and body, some of these accompanied by cirri; dorsal spines 2, stiff and solid; no foramen in axil of pectoral; air bladder more or less deeply divided into 2 lateral parts; vertebræ 12 + 31.

KEY TO THE SPECIES.

a. Dorsal and anal free from caudal; pectoral fin pointed, the middle rays produced.

b. Head moderately depressed, its width 1.35 to 1.55 in its length; third lateral line continued to opposite last rays of anal; series of pores on branchiostegals with a forward projection, forming an acute angle anteriorly. *porosissimus,* p. 922.

bb. Head strongly depressed, its width 1.07 to 1.3 in its length; third lateral line continued to opposite the beginning of the posterior third of anal; series of pores on branchiostegals without a forward projection, forming an obtuse angle anteriorly. *margaritatus,* p. 923.

aa. Dorsal and anal joined to the caudal; pectoral fin rounded, the middle rays not produced. *greenei,* p. 924.

676. Porichthys porosissimus (Cuvier & Valenciennes).

Batrachus porosissimus Cuvier & Valenciennes, Hist. Nat. Poiss., XII, 1837, 501 (St. Catherine, Cayenne, Surinam, Rio de Janeiro).

Porichthys porosissimus Günther, Cat. Fish. Brit. Mus., III, 1861, 176; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2319, Pl. CCCXXXV, fig. 811.

Porichthys plectrodon Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 291 (Galveston, Texas).

Head 3.4 to 3.8; depth 4.9 to 6.2; D. II-32 to 37; A. 31 to 33.

Body elongate; head depressed, slightly wider than deep, its width 1.35 to 1.55 in its length; snout broad, not longer than eye, with 2 dermal flaps and a row of small cirri on margin back of premaxillary; eye moderate, superior, 4.25 to 6.3 in head; lower jaw projecting; mouth large; the maxillary reaching past eye, 1.8 to 2 in head; opercle with a single stiff spine; teeth present on both jaws, vomer and palatines, those on upper jaw very small; vomer with a pair of canines on each side; some of the lateral teeth on lower jaw enlarged, forming canines; body naked; sides with 4 lateral lines, besides several series of dots and pores on head, chest and abdomen; the third lateral line continued to near last ray of anal; the series of pores on branchiostegals curved and projecting forward toward chin, forming an acute angle anteriorly; dorsal fins separate, the first with 2 solid spines; the second long and low, free from the caudal; caudal fin rounded; anal similar to second dorsal, free from caudal; pectorals wide at base, pointed, the middle rays produced, 1.2 to 1.4 in head, each interradial membrane with a pore at its base on inner side of fin.

Color light to dark brown above, paler below, golden or silvery on sides; back with 7 or 8 saddle-like blotches which are more or less confluent with blotches along sides; some of the pores marked by shining dots; fins mostly plain; anal occasionally with a brownish margin; dorsal sometimes with irregular brownish markings.

Known from North Carolina to Argentina. This species was not taken by us and there are no Panama records. It is here described from 9 specimens, ranging from 55 to 160 mm. in length, from the U.S.N.M. collection. Specimens examined are from Florida, Texas and from 33° 20′ N., 70° 05′ W., dredged by the Albatross.

677. Porichthys margaritatus (Richardson).

Batrachus margaritatus Richardson, in Hinds, Zoöl. Voy. Sulphur, Ichth., 1844, 67, Pl. XXXVIII, figs. 2, 3 and 4 (Pacific coast of Central America).

Porichthys nautopædium Jordan & Bollman, Proc. U. S. Nat. Mus., 1889, 171 (Panama Bay, Albatross Station 2802).

Porichthys margaritatus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2322; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 184 (Panama).

Porichthys notatus Boulenger, Boll. Mus. Zoöl. Anat. Torino, XIV, No. 346, 1899, 3 (Rio Tuyra, Darien; not of Girard).

Head 3.25 to 4.1; depth 5 to 5.8; D. II-34 to 37; A. 32 to 36.

Body elongate; head broad, strongly depressed, wider than deep, its width 1.07 to 1.3 in its length; eye rather small, superior, 3.9 to 6.3 in head; snout short and broad, with 2 dermal flaps and a row of fringes on margin back of premaxillary; lower jaw projecting; mouth large; the maxillary reaching past posterior margin of eye, 1.7 to 2.05 in head; opercle with a single solid spine; teeth on both jaws, vomer and palatines, those on upper jaw very small; vomer with a pair of canines on each side; some of the lateral teeth in lower jaw enlarged, forming canines; body naked; sides with 4 lateral lines, besides several series of pores on head, chest and abdomen; third lateral line ending opposite the posterior third of anal; the series of pores on branchiostegals in straight lines, forming an obtuse angle anteriorly; dorsal fins separate, the first with 2 stiff, solid spines; the second long and low, free from the caudal; caudal fin round; anal similar to second dorsal, free from caudal; pectorals long and pointed, 1.1 to 1.5 in head; a distinct pore at base of each interradial membrane on inner side of pectoral fins.

Color brownish above, pale below, golden or silvery on sides; preserved specimens at hand without cross-bars; pectorals with alternating whitish and brownish bars; dorsal with indistinct dark bars; caudal and anal with dark margins.

This species was taken in Panama Bay by the Albatross, at Station 2802, in 16 fathoms of water. It is also reported by Boulenger from the Rio Tuyra, Darien (as *P. notatus*).

Known from the Pacific coast of Tropical America. This species is closely related to *P. porosissimus*.

678. **Porichthys greenei** Gilbert & Starks.

Porichthys greenei Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 184 (Panama Bay).

Head 3.9 to 4.3; depth 4.8 to 6.5; D. II-36 to 39; A. 32 to 36.

Body elongate; head depressed, its width greater than its depth, 1.15 to 1.4 in its length; eyes very small, wholly superior, rather close together, 6.2 to 6.6 in head; snout broad, not much longer than eye, with 2 dermal appendages near tip back of premaxillary; lower jaw projecting; mouth moderate; the maxillary reaching past eye, 2 to 2.3 in head, its posterior membranous border fringed; opercle with a single stiff spine; teeth present on both jaws, vomer and palatines, those on upper jaw very small; vomer with a pair of canines on each side; some of the lateral teeth on lower jaw enlarged, canine-like; body naked; sides with 4 lateral lines, besides several series of pores on head, chest and abdomen; third lateral line ending near beginning of posterior third of base of anal; series of pores on branchiostegals without a forward projection, forming an obtuse angle anteriorly; dorsal fins separate, the first with 2 solid spines; the second long and low, joined to upper rays of caudal; caudal fin round; anal similar to second dorsal, joined to lower rays of caudal; pectorals round, the middle rays not produced, 1.1 to 1.33 in head, each interradial membrane with a pore and canal on inner side of fin.

Color bright golden in life; a dark brown band on head, back of eyes; back with 6 distinct, dark brown, saddle-like blotches. Fins plain golden in life, mostly pale in spirits; vertical fins sometimes slightly dusky.

This species is represented by 12 specimens in the present collection, ranging from 70 to 85 mm. in length.

Known from the Pacific coast of Panama. Our specimens are from Balboa and Panama; mostly from rocky tide pools.

Family LXXX. Gobiesocidæ.

THE CLING-FISHES.

Body rather elongate, broad and depressed in front; mouth moderate; upper jaw protractile; teeth usually rather strong, the anterior ones conical or incisor-like; no bony stay across cheek; opercle reduced to a spine-like projection, concealed in the skin and sometimes obsolete; pseudobranchiæ small or wanting; gills 2½ or 3; gill-membranes broadly united, free or united with the isthmus; scales entirely wanting; dorsal and anal similar, situated on posterior part of body and nearly or quite opposite each other, consisting of soft rays only; ventral fins far apart, each with 1 concealed spine and 4 or 5 soft rays; a large sucking disk present between the ventrals, the fins usually forming a part of it. This family is composed of small fishes which live chiefly in warm seas, clinging to stones and other objects by means of the sucking disk.

KEY TO THE GENERA.

a.	Incisors of lower jaw with entire edges.	*Gobiesox*, p. 925.
aa.	Incisors of lower jaw tricuspid or serrate.	*Arbaciosa*, p. 926.

252. Genus **Gobiesox** Lacépède.

Gobiesox Lacépède, Hist. Nat. Poiss., II, 1800, 595 (type *Gobiesox cephalus* Lacépède).

Megaphalus Rafinesque, Analyse Nat., etc., 1815, 86 (substitute for *Gobiesox*, regarded as objectionable).

Sicyases Müller & Troschel, in Müller, Archiv. Naturg., IX, 1843, 298 (type *Sicyases sanguineus* Müller & Troschel).

Tomicodon Brisout de Barneville, Rev. Zoöl., 1846, 144 (type *Tomicodon chilensis* Brisout de Barneville).

Sicyogaster Brisout de Barneville, Rev. Zoöl., 1846, 144 (type *Gobiesox marmoratus* Jenyns).

Body anteriorly very broad and depressed, posteriorly slender; head large, rounded; mouth terminal; lower jaw with a series of strong incisors in front, their edges rounded or truncate; upper jaw with a series of strong teeth, sometimes followed by smaller teeth; no teeth on vomer or palatines; gills 3; gill-membranes broadly united, free from the isthmus; sucking disk large. Small fishes which cling to rocks or other objects near the shore, living mostly in the tropics. A single species is known from Panama.*

679. **Gobiesox rhodospilus** Günther.

Gobiesox rhodospilus Günther, Proc. Zoöl. Soc. London, 1864, 25 (Panama); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2335; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 189.

This species is known from Panama (Pacific coast) from 2 specimens, each about 32 mm. in length, collected by Captain Dow. It has not been seen by later collectors. The following description is after Günther:

D. 6; A. 5; C. 8 or 9; P. 17. A vertical fold of skin along lower half of base of pectoral. Distance from front of dorsal to caudal 2⅔ in its distance from snout; anal above third dorsal ray. A very narrow band of short conical teeth in upper jaw, 1 lateral tooth larger than the others, recurved, canine-like; lower jaw with 1 series of teeth, the anterior narrow incisors, the outer distinctly canine, like the outer above. Rose-colored with rose-red transverse spots, each with an edge of deep red dots.

Known from Panama and Santa Helena Bay near Guayaquil. The species was not seen by us.

253. Genus **Arbaciosa** Jordan & Evermann.

Arbaciosa Jordan & Evermann, in Jordan, Proc. Cal. Ac. Sci., 2nd Ser., VI, 1896, 230 (type *Gobiesox humeralis* Gilbert).

This genus differs from *Gobiesox* chiefly in the character of the

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*Since these pages were prepared a second species, *G. microspilus*, was described from Panama Bay by Fowler (Proc. Ac. Nat. Sci. Phila., 1916, p. 412).

incisors on the lower jaw, which are strongly notched or tricuspid. The species are small in size and the dorsal and anal fins are short.

KEY TO THE SPECIES.

a. Dorsal fin with 6 rays; anal fin with 5 or 6 rays; opercular spine evident. *zebra*, p. 927.

aa. Dorsal fin with 5 rays; anal fin with 4 rays; opercular spine obsolete. *minuta* sp. nov., p. 928.

680. **Arbaciosa zebra** (Jordan & Gilbert).

Gobiesox zebra Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881 (1882), 359 (Mazatlan, Mexico).

Arbaciosa zebra Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2341; Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 160 (Taboguilla Island, Panama Bay).

Head 3.25 to 3.8; depth 7.7 to 9.75; D. 6; A. 5 or 6.

Body anteriorly broad, depressed, posteriorly compressed; head low and broad, its width 4.5 to 4.75 in length; snout slightly acute, 3.35 to 4.2 in head; eye moderate, 4.2 to 4.3; interorbital 3 to 4; mouth small, slightly inferior, the upper lip protruding; teeth in lower jaw broad, distinctly notched; gill-membranes broadly united, free from the isthmus; opercular spine evident; ventral disk moderate, its width about 1.5 in head; dorsal fin rather small, inserted a little nearer tip of caudal than margin of opercle; caudal fin round; anal fin rather short, its origin under middle of base of dorsal; ventral fins short, posteriorly free from the disk; pectoral fins short and broad, 2.5 to 3 in head.

The color is described in the original description by Jordan & Gilbert as follows: "Back with five dark cross-bars about as wide as the interspaces, three of them in front of the dorsal fin, the two anterior much broader and more distinct than the others; these bars are all distinct on the back, fading on the sides, which are often vaguely clouded with dark; the color of these dark bars varies from reddish-brown to black, and that of the interspaces from olivaceous to light pink and bright rose-red; top of head bright red, marbled with light slaty-bluish; a black blotch on opercle, and two very distinct black cross spots, one on each side of median line, forming the front of first dorsal bar; sometimes cheeks with two or three pale bluish streaks; dorsal, pectoral, and caudal more or less shaded with dusky; lower fins pale; usually a dark bar at base of caudal and one across middle of the fin." It was later pointed out that a large variation in color exists in the species. The preserved specimens at hand are brownish, the upper parts with irregular darker markings. There are indications of dark bars on the back of only 1 of 5 specimens examined.

This species was not taken by us, but we have examined 5 specimens from Taboguilla Island, collected by the Albatross and recorded by Kendall & Radcliffe (1912).

Known from Lower California to Panama Bay.

681. Arbaciosa minuta sp. nov. (Plate XCII.)

Type No. 81523, U. S. N. M.; length 22 mm.; tide pools, Colon.

Head 3.6; depth 7.2; D. 5; A. 4.

Body anteriorly much depressed, broad and low, the depth equal to about half the width at base of pectorals, compressed posteriorly; head low and broad; snout rounded, about as long as eye; eye moderate, 3.8 in head; interorbital rather broad, 2.5 in head; mouth horizontal, nearly terminal; the upper jaw slightly protruding; teeth anteriorly in the jaws broad, notched, tricuspid, smaller and narrow at sides; gill-membranes broadly united, free from the isthmus; a fold of skin along lower lateral margin of head; opercular spine obsolete; side of head behind eye with a concealed antrorse spine; ventral disk large, 1.1 in head, 4 in body; dorsal fin small, inserted about equidistant from margin of opercle and tip of caudal; caudal fin rather long, rounded; anal fin very short, its origin under middle of base of dorsal; ventral fins shorter than head, inserted under margin of opercle, that part of disk situated between and in advance of ventrals united with the base and outer rays of fins; pectoral fins broad, rounded, the median rays longest.

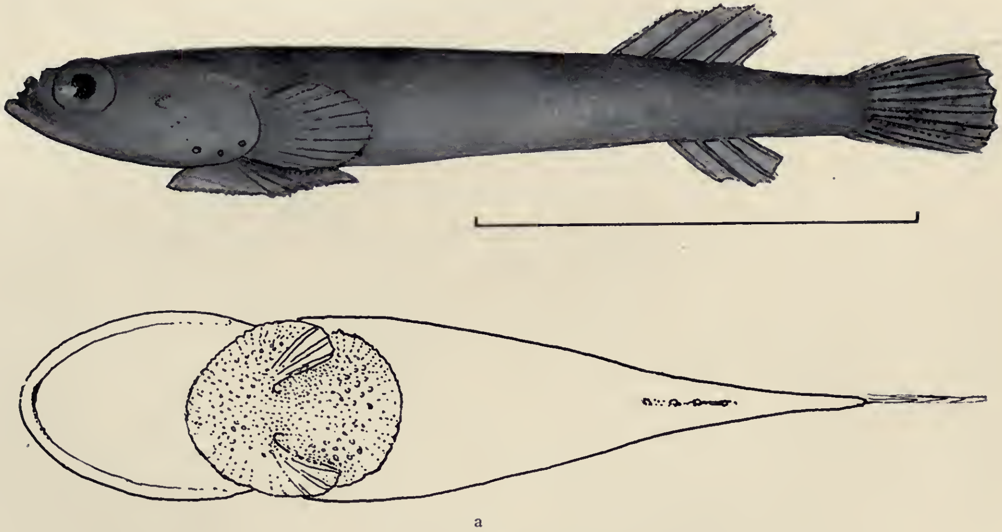
Color in alcohol brownish above, pale below; top of head and back with indefinite dark spots, forming 2 indefinite H-shaped markings on anterior part of back; dorsal fin dark brownish; the caudal fin somewhat paler, with 2 rather distinct dark cross-bars; pectoral and ventral fins pale.

A single specimen, 22 mm. long, of this little fish occurs in the Panama collection. It is characterized by the obsolete opercular spine, and by the very short dorsal and anal fins. Our specimen was taken in a tide pool at Colon.

Family LXXXI. Blenniidæ.

THE BLENNIES.

Body elongate; mouth large or small; teeth various; gill-membranes free from the isthmus or attached to it; lateral line variously developed, often wanting, sometimes duplicated or branched; scales



ARBACIOSA MINUTA sp. nov.
a. Ventral outline.
Drawn from the type 22 mm. in length.

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moderate or small, or wanting; dorsal fin with spines, at least anteriorly, with or without soft rays; caudal fin well developed; anal fin long, similar to soft dorsal; ventral fins, if present, jugular or subthoracic, consisting of 1 spine and 1 to 3 soft rays.

This is a large family of small or moderate sized fishes, living mostly near the shore in tropical, temperate and arctic seas. Few if any of them are of commercial value.

KEY TO THE GENERA.

a. Body partly or entirely covered with scales.

b. Dorsal fin composed wholly of spines or with one soft ray only, a notch between the third and fourth spines. *Auchenopterus*, p. 930.

bb. Dorsal fin composed of numerous spines and soft rays.

c. No dermal tentacles present over eyes or at nape. *Mnierpes*, p. 933.

cc. Dermal tentacles present over eyes and at nape.

d. Teeth in the jaws in more than one series, usually an enlarged outer series with a band of villiform teeth behind it.

e. Cornea divided by an oblique pigmented band into an anterior lower and posterior upper half; nape on each side with a single short tentacle. *Dialommus*, p. 934.

ee. Cornea normal; nape with a tuft or series of tentacles. *Labrisomus*, p. 935.

dd. Teeth in the jaws in a single series; vomer with a few teeth or none; a comb of fine tentacles at nape. *Malacoctenus*, p. 938.

aa. Body entirely scaleless.

f. Teeth in the jaws in a single series.

g. Teeth all fixed, attached to the bone of the jaw, not movable.

h. One or both jaws with a pair of stout fang-like canines on each side; gill-membranes free from the isthmus, or at least forming a fold across it. *Blennius*, p. 940.

hh. No canines in jaws; gill-membranes fully united with the isthmus; the gill-openings restricted to the sides.

i. Ventrals with 1 short spine and 3 simple rays; mouth small. *Hypsoblennius*, p. 942.

ii. Ventrals with 1 spine and 4 simple rays; mouth rather large. *Homesthes*, p. 947.

gg. Teeth on front of jaws implanted on lips, all movable.

j. One or both jaws posteriorly with a pair of strong fang-like canines.

k. Vomer toothless; dorsal fin continuous. *Rupiscartes*, p. 948.

kk. Vomer with a single series of conical teeth; dorsal fin rather deeply notched. *Salarichthys*, p. 949.

jj. No canines in jaws. *Salarias*, p. 951.

ff. An enlarged series of teeth on margin of each jaw, with a band of villiform teeth behind it on anterior part of jaws; no canines; vomer and palatines each with a single series of strong teeth; the vomerine teeth separated from the palatine teeth by a slight interruption; no cirri at nape; no lateral line. *Emblemaria*, p. 952.

254. Genus **Auchenopterus** Günther.

Auchenopterus Günther, Cat. Fish. Brit. Mus., III, 1861, 275 (type *Auchenopterus monophthalmus* Günther).

Cremnobates Günther, Proc. Zoöl. Soc. London, 1861, 374 (type *Auchenopterus monophthalmus;* substitute for *Auchenopterus,* regarded as preoccupied on account of its similarity to *Auchenipterus,* a genus of *Siluridæ).*

Body elongate, compressed; head rather short; snout pointed; mouth moderate, oblique; teeth in the jaws anteriorly in bands; vomer with one or more series of teeth; palatines toothless; gill-membranes united, free from the isthmus; lateral line complete, anteriorly with a long arch; upper surface of head with tentacles; scales moderate, cycloid, wanting on head; dorsal fin with more or less of a notch between the third and fourth spines, usually with one soft ray only; anal fin low, with 2 short spines; pectoral fins broad; ventrals jugular.

KEY TO THE SPECIES.

a. Scales in lateral series 30 to 34; 4 scales in an oblique series between the beginning of the straight portion of the lateral line and the base of dorsal; anal formula II, 18 or 19; the last ray of dorsal a distinct spine. *affinis*, p. 930.

aa. Scales in lateral series 35 to 38; 5, or rarely 4½, scales in an oblique series between the beginning of the straight portion of lateral line and base of dorsal; anal formula II, 20, rarely II, 19; the last ray of dorsal soft. *monophthalmus*, p. 932.

682. **Auchenopterus affinis** (Steindachner). (Plate XCIII, fig. 1.)

Cremnobates affinis Steindachner, (Sitzb. k. Ak. Wiss. Wien) Ichth. Beitr., V, 1876, 178 (St. Thomas); Jordan, Proc. U. S. Nat. Mus., 1884, 142 (Key West, Florida).

Auchenopterus affinis Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2371.

Head 3.5 to 3.9; depth 3.6 to 4.25; D. III-XXV or XXVI; A. II, 18 or 19; scales 30 to 34.

Body elongate, compressed; head deeper than broad; snout pointed, 3.55 to 4 in head; eye 3.7 to 4.5; interorbital a little narrower than eye; mouth moderate, terminal, oblique; maxillary reaching opposite or slightly beyond middle of eye, 1.8 to 2.25 in head; teeth in the jaws anteriorly in broad villiform bands, reduced to a single series at sides, wanting posteriorly; vomer with a horseshoe-shaped band of villiform teeth; opercle with a short spine at upper angle; preopercle unarmed; gill-membranes broadly connected, free from the isthmus; lateral line with a long arch anteriorly, the arched portion about ¾ the length of the straight part; a pair of fringed tentacles over eye and another pair at occiput; scales moderate, cycloid, 4 in an oblique series between the beginning of the straight part of lateral line and base of dorsal; dorsal fin composed of spines only, the notch between the third and fourth spines various, rather deep or very shallow, the membrane of the last spine attached to base of caudal; caudal fin rounded, notably shorter than head; anal fin moderate, not as high as the dorsal, its base equal to half the length of body without snout and eye; ventral fin inserted under the free edge of gill-membrane, with only 2 rays; pectoral fins rather broad, 1.05 to 1.4 in head.

Color in life of a specimen 39 mm. long: Body and eyes dark red; dorsal and anal deep red, with pale margin; the second dorsal with a black ocellated spot between the nineteenth and twenty-first spines; caudal fin with a black base, the rest of fin pale red, with brownish markings; ventrals and pectorals light red with brownish bars. The specimen on which the above color description was based is much lighter in alcohol than our other specimens, most of which have rather distinct brownish cross-bars on sides and brown markings, forming cross-lines on the lower surface of the head. In these specimens the fins are all spotted and barred with dark brown. One specimen is dark brown, with the dorsal and anal fins nearly black.

This fish is represented by 7 specimens in the present collection, ranging in length from 40 to 50 mm. Our specimens seem to differ somewhat from published descriptions in having a slightly shorter dorsal fin, the formula given in current descriptions being III-XXVII, I; the original description gives III-XXVIII, stating specifically that the last spine (not ray) is attached to the base of the caudal by a membrane. Later authors state that the dorsal has one soft ray, which is not true of our specimens, and evidently not of the type.

Recorded from Key West and the West Indies and now for the first time from the coast of Panama. Our specimens are all from Fox Bay, Colon.

683. Auchenopterus monophthalmus Günther. (Plate XCIII, fig.2.)

Auchenopterus monophthalmus Günther, Cat. Fish. Brit. Mus., III, 1861, 275 (Panama); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2372; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 189 (tide pools, Panama).

Cremnobates monophthalmus Günther, Proc. Zoöl. Soc. London, 1861, 374.

Auchenopterus monopthalmus Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 152 (Perico Island, Panama Bay).

Head 3.6 to 4.1; depth 3.9 to 5; D. III-XXV or XXVI, 1; A. II, 20, rarely II, 19; scales 35 to 38.

Body elongate, compressed; head low, a little deeper than wide; snout pointed, 3.4 to 4.4 in head; eye 3.25 to 4.45; interorbital about half the width of eye; mouth rather large, terminal, or the lower jaw slightly projecting, oblique; maxillary reaching posterior margin of pupil or beyond, 1.9 to 2.4 in head; teeth in the jaws anteriorly in broad villiform bands, reduced to a single series at sides, wanting posteriorly; vomer with a horseshoe-shaped band of villiform teeth; opercle with a short spine at upper angle; preopercle unarmed; gill-membranes broadly connected, free from the isthmus; lateral line anteriorly with a long arch, the arched portion about ¾ the length of the straight part; a pair of fringed tentacles over eye and another small pair at occiput; scales rather small, cycloid, 5 or rarely 4½ scales in an oblique row between the beginning of the straight part of the lateral line and the base of dorsal; dorsal fin with a single soft ray, the notch between the third and fourth spines pronounced, extending nearly or quite to base of fin, the soft ray attached to base of caudal by a membrane; caudal fin rounded, notably shorter than head; anal fin not as high as the dorsal; ventral fins inserted under or just back of margin of gill-membranes, composed of 2 rays; pectorals rather broad, 1.15 to 1.45 in head.

Color dark brown above, paler below; sides sometimes with irregular dark markings; lower surface of head with dark spots, forming more or less distinct cross-bars in female; these parts plain in the male; the dorsal and anal uniform dark brown, with a pale margin,

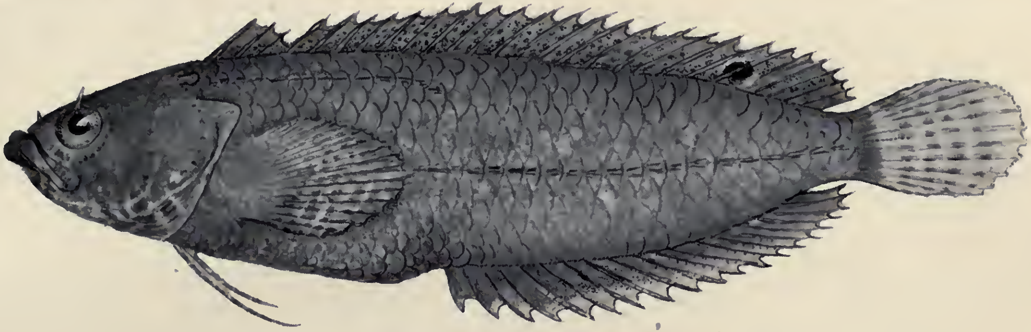

FIG. 1. AUCHENOPTERUS AFFINIS (Steindachner).
From a specimen 46 mm. in length.

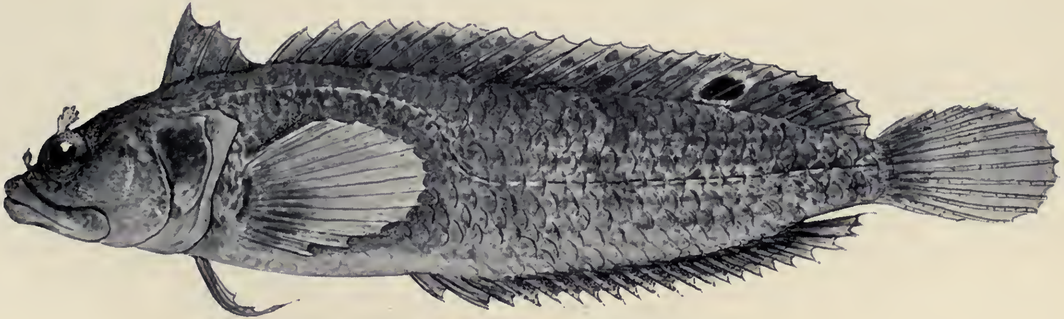

FIG. 2, AUCHENOPTERUS MONOPHTHALMUS Günther.
From a specimen 73 mm. in length.

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or pale, with dark cross-bars; a black ocellus between the eighteenth and twenty-first spines; caudal fin with a black bar at base, the rest of the fin variously marked, plain dusky, or with the lower fourth of fin black and the upper part pale with dark markings, or simply pale, with black spots sometimes forming distinct cross-bars; caudal fin uniform pale brown in female, with dark spots or other markings in the male; ventrals and pectorals with black spots, forming more or less distinct bars in female, usually plain brown to pale in the male.

This is a very common fish in the tide pools on the coral reef at Panama City. The sexes may be distinguished by the color as already pointed out, also by the size of the mouth, the male having a notably larger mouth, with the maxillary extending opposite posterior margin of eye. The Panama collection contains 78 specimens, ranging from 35 to 72 mm. in length.

This fish is closely related to *A. affinis* from the Atlantic coast, from which it may, however, be distinguished by the slightly more numerous scales in a lateral series, as well as in the number of rows of scales above the straight part of the lateral line. The anal fin normally has one or two soft rays and the dorsal has the last ray soft, which in *A. affinis* is a distinct spine.

Known from the Gulf of California to Panama. Our specimens are all from tide pools at Balboa and Panama City.

255. Genus **Mnierpes** Jordan & Evermann.

Mnierpes Jordan & Evermann, Rept. U. S. Fish Comm., XXI 1895 (1896), 468 (type *Clinus macrocephalus* Günther).

Body very elongate; the head low and broad; upper lip thickened; no dermal tentacle over eye or at nape; teeth in the jaws in villiform bands, with an enlarged outer series; a band of pointed teeth on vomer, none on palatines; scales small, cycloid; dorsal spines numerous, about 22, soft rays about 12.

A single species of the genus is known.

681. Mnierpes macrocephalus (Günther).

Clinus macrocephalus Günther, Cat. Fish. Brit. Mus., III, 1861, 266 (Pacific coast of Central America); Boulenger, Boll. Mus. Zoöl. Anat. Torino, XIV, No. 346, 1899, 4 (Flamenco Island, Panama Bay).

Labrosomus macrocephalus Jordan, Proc. U. S. Nat. Mus., 1885, 389.

Mnierpes macrocephalus Jordan & Evermann, Rept. U. S. Fish Comm., XXI, 1895 (1896), 468; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2364; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 189; Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 152 (Perico and Taboguilla islands, Panama Bay).

Head 4.4 to 5.05; depth 5.65 to 7.3; D. XXII, 12 or 13; A. II, 24 or 25; scales about 75.

Body elongate, compressed; head broader than deep; snout short, 3.6 to 4.1 in head; eye 3.35 to 3.8; mouth horizontal, upper lip protruding; maxillary reaching nearly to posterior margin of eye, 2.1 to 2.45 in head; teeth in jaws in villiform bands, the outer series slightly enlarged; vomer with a narrow band of pointed teeth; anterior nostril with a very short fringed tentacle; no tentacles over eye or at nape; gill-membranes connected, free from the isthmus; lateral line arched anteriorly, becoming straight under middle of spinous part of dorsal; scales small, difficult to enumerate, cycloid, covering entire body except head and chest; dorsal fin long, with a slight indentation between the spinous and soft parts, its origin over margin of preopercle; caudal fin round; anal fin moderate, with 2 very short spines; ventrals short; pectorals moderate, 1 to 1.33 in head.

Color dark gray above; under parts pale; sides with more or less distinct dark blotches and with indefinite pale spots, the latter distinct on sides of head and on snout; fins rather pale, the rays usually with more or less distinct brown spots.

This species, although taken at Panama several times, does not occur in our collection. We have examined 6 fine specimens from Perico Island, Panama Bay, taken by the Albatross, and now deposited in the U. S. National Museum. These specimens range in length from 70 to 108 mm. and form the basis for the above description.

The species appears to have been recorded only from the west coast of Panama.

256. Genus **Dialommus** Gilbert.

Dialommus Gilbert, Proc. U. S. Nat. Mus., 1890, 452 (type *Dialommus fuscus* Gilbert).

Body elongate, slender; head low and short; teeth in the jaws in narrow bands; vomer with a single series of teeth, none on palatines; the cornea divided by an oblique pigmented band into an anterior lower and a posterior upper half; posterior nostril with a short fringed tentacle; upper margin of eye ball with one or more slender tentacles; each side of nape with a single short tentacle; scales rather small;

dorsal fin very long, without notch, composed of numerous spines and soft rays; ventral fins short, with I, 3 rays.

A single species of this genus is known.

682. **Dialommus fuscus** Gilbert.

Dialommus fuscus Gilbert, Proc. U. S. Nat. Mus., 1890, 452 (Galapagos Islands); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2868; Kendall & Radcliffe, Memoir. Mus. Com. Zoöl., XXXV, 1912, 153 (Chatham Island and Perico Island).

Head 5 to 6; depth 6 to 7; D. XXV, 13 to 15; A. I, 28; scales about 60.

Body elongate, slender; head very short, broader than deep; snout very short, 3.5 to 4 in head; eye 2.7 to 3.15; mouth horizontal, the upper lip protruding; maxillary reaching nearly to vertical from posterior margin of eye, 2.4 to 2.65 in head; teeth in bands in the jaws, the outer series enlarged; vomer with a single series of teeth; palatines toothless; gill-membranes united, free from the isthmus; anterior nostril with a short fringed tentacle; 1 to 3 short tentacles on upper margin of eye ball and a single tentacle on each side at nape; lateral line anteriorly with a short arch; scales rather small and thin; dorsal fin very long, not notched, its origin a little in advance of opercular margin; caudal fin round, a little longer than head; anal fin long, with a single very short spine; ventral fins notably shorter than head; pectoral fins equal to or longer than head.

Color brownish above and on sides; under parts pale; the back with traces of black cross-bars, extending on base of dorsal fin; sides in some specimens with pearly spots; ventral fins pale; the other fins all dusky, with more or less distinct dark spots.

This fish is recorded by Kendall & Radcliffe from Perico Island, Panama Bay, where one specimen, 46 mm. long, was taken in a tide pool by the Albatross. It does not occur in our collection. The above description is based on 2 specimens, respectively 58 and 70 mm. in length, from Chatham Island.

Known from Panama south to the Galapagos Islands.

257. Genus **Labrisomus** Swainson.

Labrisomus Swainson, Nat. Hist. & Class. Fish., II, 1839, 277 (type *Clinus pectinifer* Cuvier & Valenciennes).

Lepisoma DeKay, Fauna N. Y., Fishes, 1842, 41 (type *Lepisoma cirrhosum* DeKay = *Clinus pectinifer* Cuvier & Valenciennes).

Labrosomus Gill, Proc. Ac. Nat. Sci. Phila., 1860, 105 (corrected spelling).

Body oblong, robust; head short, compressed; mouth rather large; teeth in the jaws in a band, the outer series notably enlarged and more or less separated from the villiform teeth behind it; vomer with teeth; one or more tentacles present on upper margin of eye; sides of neck with a tuft or series of tentacles; scales rather small, cycloid; lateral line complete, anteriorly arched; dorsal fin single, very long, composed of numerous spines and soft rays; pectorals long.

Two species, one from each coast, are represented in the Panama collection.

KEY TO THE SPECIES.

a. Dorsal with 12 soft rays, the posterior spines of dorsal not notably shorter than the median ones; maxillary 1.95 to 2.25 in head. *nuchipinnis*, p. 936.

aa. Dorsal with 13 soft rays, the posterior spines of dorsal notably shorter than the median ones; maxillary 1.85 to 1.95 in head. *xanti*, p. 937.

686. Labrisomus nuchipinnis (Quoy & Gaimard). (Plate XCIV, fig. 1.)

Clinus nuchipinnis Quoy & Gaimard, in Freycinet, Voy. Uranie et Physicienne, Zoöl., 1824, 255 (Brazil).

Clinus pectinifer Cuvier & Valenciennes, Hist. Nat. Poiss., XI, 1836, 374 (Bahia).

Clinus capillatus Cuvier & Valenciennes, Hist. Nat. Poiss., XI, 1836, 377.

Lepisoma cirrhosum DeKay, Fauna N. Y., Fishes, 1842, 41, Pl. XXX, fig. 94 (Florida).

Labrosomus pectinifer Gill, Proc. Ac. Nat. Sci. Phila., 1860, 105.

Labrosomus capillatus Gill, Proc. Ac. Nat. Sci. Phila., 1860, 107.

Labrisomus nuchipinnis Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2362; Breder, Zoologica, IV, Pt. 4, 1925, 157 (Caledonia Bay).

Head 3.2 to 3.5; depth 3.5 to 3.9; D. XVIII, 12; A. II, 17 or 18; scales 68 to 80.

Body elongate, compressed; head low; snout moderate, 3 to 3.3 in head; eye 3.8 to 4.7; mouth rather large, terminal, slightly oblique; maxillary reaching nearly or quite to opposite posterior margin of pupil, 1.95 to 2.25 in head; teeth in the jaws in bands, the outer series

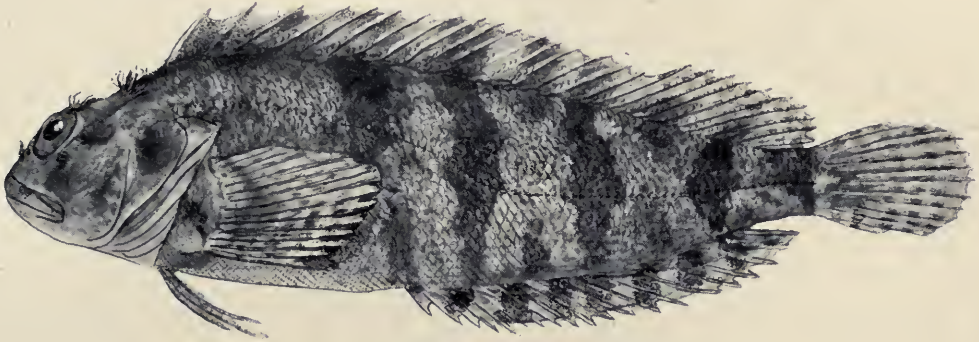

FIG. 1. LABRISOMUS NUCHIPINNIS (Quoy & Gaimard).
From a specimen 105 mm. in length.

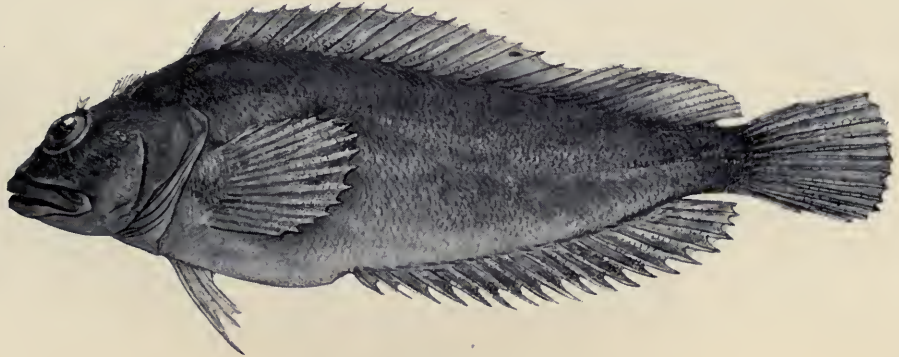

FIG. 2. LABRISOMUS XANTI Gill.
From a specimen 143 mm. in length.

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in each jaw notably enlarged; vomer with a band of villiform teeth extending backward on palatines; opercle and preopercle unarmed; gill-membranes connected, free from the isthmus; lateral line complete, anteriorly with a long low arch, the arched portion equal in length to the straight part; anterior nostril and upper margin of eye each with a tuft of fine tentacles; a nuchal series of slender tentacles present; scales small, cycloid, covering entire body except head; dorsal fin very long, the posterior spines not notably reduced in length, the soft part higher than the spines; caudal fin broadly rounded; anal fin moderate, the tips of most of the rays free; ventral fins close together, inserted under posterior margin of preopercle, with a spine and 3 soft rays; pectoral fins broad, 1.25 to 1.6 in head.

Color in alcohol dark brown above, somewhat paler below; sides with more or less distinct dark cross-bars and blotches; opercle with a black spot; sides of head and chin without irregular dark lines; fins brownish, all except the ventrals more or less spotted with dark, forming irregular cross-bars; spinous dorsal anteriorly with a large black spot. The dark cross-bars of sides are sometimes indistinctly extended on the dorsal and anal fins.

This is a common species on the Atlantic coast of Panama where it inhabits rocky tide pools. The species is represented in the present collection by 91 specimens, ranging in length from 50 to 125 mm. Specimens taken in May have the ovaries well distended with eggs.

The range of the species appears to extend from Florida south to Brazil. Our specimens are from Toro Point, Colon and Porto Bello.

687. **Labrisomus xanti** Gill. (Plate XCIV., fig. 2.)

Labrosomus xanti Gill, Proc. Ac. Nat. Sci. Phila., 1860, 107 (Cerro Blanco).

Labrisomus xanti Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2362.

Head 3.3 to 3.45; depth 3.3 to 3.45; D. XVIII, 13; A. II, 18 or 19; scales 65 to 79.

Body rather robust, compressed; head low; snout moderate, 3.35 in head; eye 3.95 to 4.7; mouth large, terminal, slightly oblique; maxillary reaching nearly to vertical from posterior margin of eye, 1.85 to 1.95 in head; teeth in the jaws in a band, the outer series notably enlarged, more or less canine-like and well separated from the band of villiform teeth behind it; vomer with a single series of short, stout teeth; palatines with a narrow band of blunt teeth; opercle and preopercle unarmed; gill-membranes united, free from the isthmus; lateral line complete, anteriorly with a long arch, longer than the straight portion; anterior nostril and upper margin of eye each with a tuft of tentacles; a nuchal comb of tentacles present; scales rather small, cycloid, covering entire body, except head; dorsal fin very long, the spines increasing in length gradually from the first to the middle of fin, the posterior spines again somewhat shorter, the soft portion notably higher than the spinous part; caudal round; anal rather long, increasing in height posteriorly; ventral fins close together, inserted under margin of preopercle; pectoral fins moderate, 1.45 to 1.85 in head.

Color in alcohol brownish above, somewhat paler below, with or without dark cross-bars; a few faint bluish markings behind and below eye; a small dark spot on membrane at upper angle of gill-opening; fins uniform brownish, the anal darkest, with a dark intramarginal band; a dark ocellus between the 15th and 16th spines of dorsal in one of our specimens, wanting in the others.

This species, which is very closely related to *L. nuchipinnis* from the Atlantic coast, is represented by 3 specimens, 115, 135 and 140 mm. in length.

Known from Lower California to Panama. Our specimens are from Chame Point and Panama City.

258. Genus **Malacoctenus** Gill.

Malacoctenus Gill, Proc. Ac. Nat. Sci. Phila., 1860, 103 (type *Clinus delalandii* Cuvier & Valenciennes).

This genus appears to differ from *Labrisomus* in the dentition, the teeth in the jaws being in a single series; vomer with a few teeth or none; no palatine teeth.

KEY TO THE SPECIES.

a. Body moderately robust, the depth 3 to 3.8 in length; scales moderate, 49 to 52 in lateral series; dorsal formula XX, 9 or 10. *delalandii,* p. 938.

aa. Body less robust, the depth 4.3 to 4.65 in length; scales somewhat smaller, 56 to 60; dorsal formula XX, 11 or 12. *zonifer,* p. 940.

688. Malacoctenus delalandii (Cuvier & Valenciennes). (Plate XCV, fig. 1.)

Clinus delalandii Cuvier & Valenciennes, Hist. Nat. Poiss., XI, 1836, 378 (Brazil); Günther, Cat. Fish. Brit. Mus., III, 1861, 264.

Malacoctenus delalandii Gill, Proc. Ac. Nat. Sci. Phila., 1860, 103.

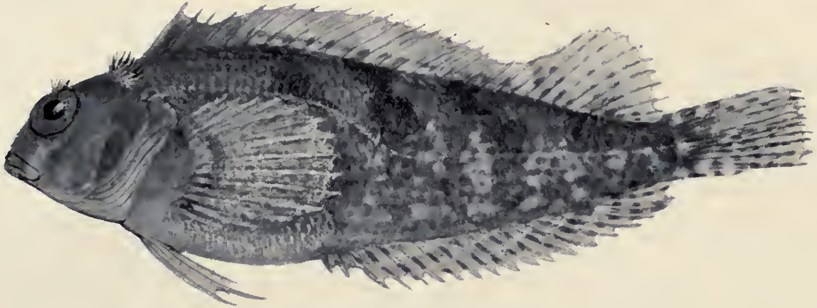

FIG. 1. MALACOCTENUS DELALANDII (Cuvier & Valenciennes).
From a specimen 60 mm. in length.

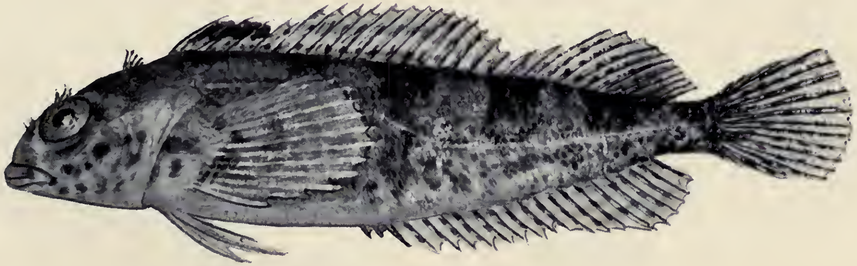

FIG. 2. MALACOCTENUS ZONIFER (Jordan & Gilbert).
From a specimen 72 mm. in length.

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Malacoctenus delalandi Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2358 (in part).

Head 3.5 to 3.9; depth 3 to 3.8; D. XX, 9 or 10; A. II, 18 or 19; scales 49 to 52.

Body elongate, compressed; head moderate; snout rather short, 3 to 3.5 in head; eye 3 to 3.5; mouth rather small, terminal, nearly horizontal; maxillary reaching anterior margin of eye, 3 to 3.5 in head; teeth in the jaws in a single series, flattened at the base, pointed at tips; vomer with a patch of villiform teeth; opercle and preopercle unarmed; gill-membranes connected, free from the isthmus; lateral line complete, the arched portion nearly as long as the straight part; anterior nostril and upper margin of eye each with a tuft of slender tentacles; a nuchal comb of fine tentacles present; scales moderate, cycloid, covering entire body, except head and a portion of chest; dorsal fin very long, the soft part higher than the spines; caudal fin round; anal fin moderate, the tips of the rays fleshy and usually separate; ventral fins close together, inserted slightly behind posterior margin of preopercle, with a spine and 3 rays; pectoral fins rather broad, equal to length of head.

Color in alcohol brownish; sides with more or less distinct dark cross-bars and blotches; some specimens much more uniform in color than others; opercle with an indistinct black spot; sides of head and chin more or less distinctly marked with dark bars; fins brownish, of nearly uniform color in some specimens, spotted with dark brown in others; a more or less distinct dark spot present on anterior part of spinous dorsal. The following color description we copy from our field notes: "Upper parts of body brownish, lower parts pale green; sides with indistinct vertical bars; lower part of sides with many brown markings. Dorsal, anal and caudal greenish yellow, with many brown markings which sometimes form bars; margin of anal pink; ventrals pink; pectorals with brown bar at base, then pale green, the margin reddish."

This species appears to be somewhat less common than *Labrisomus nuchipinnis,* but is found in company with it. We have 22 specimens, ranging from 47 to 59 mm. in length. Females taken in March have the ovaries well distended with eggs.

The range of this species appears to extend from Panama to Brazil. Our specimens are from Colon and Porto Bello.

689. Malacoctenus zonifer (Jordan & Gilbert). (Plate XCV, fig. 2.)

Clinus zonifer Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881, 361 (Mazatlan).

Malacoctenus delalandi Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2358 (in part, not of Cuvier & Valenciennes); Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 189.

Malacoctenus delalandii Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 151 (Perico Island, Panama Bay).

Head 3.65 to 3.8; depth 4 to 4.3; D. XIX or XX, 11 or 12; A. II, 19; scales 54 to 57.

A specimen, 72 mm. long, was taken by us from a tide pool at Balboa and a second one, 46 mm. in length, was sent by Mr. Robert Tweedlie. We have also examined specimens taken by the Albatross at Perico Island. Comparing these specimens with our specimens of *M. delalandii* from the Atlantic coast, we find that the body of *M. zonifer* is a little more slender, the scales a little smaller and the dorsal fin slightly longer.

Known from Lower California to Panama. Our specimens are from Balboa and Chame Point.

259. Genus **Blennius** Linnæus.

Blennius Linnæus, Syst. Nat., Ed. X, 1758, 256 (type *Blennius ocellaris* Linnæus).

Body elongate, compressed; head short, the profile usually bluntly rounded; mouth small, horizontal; the jaws each with a single series of long, slender, curved, close-set, immovable teeth; the lower jaw at least with a short, stout, fang-like tooth on each side; gill-openings large, the membranes free from the isthmus or at least forming a fold across it; scales wanting; lateral line developed anteriorly; dorsal fin entire or more or less notched; ventral fins well developed, with I, 3 rays.

KEY TO THE SPECIES.

a. Each jaw with a pair of strong canines; no crest at nape; D. XII, 21 or 22; A. 23 or 24. *pilicornis,* p. 941.

aa. Canines present in lower jaw only; nape with a longitudinal dermal crest, provided with about 20 filaments; D. XI, 16; A. 19. *cristatus,* p. 941.

690. Blennius pilicornis Cuvier & Valenciennes.

Blennius pilicornis Cuvier & Valenciennes, Hist. Nat. Poiss., XI, 1836, 254 (Rio de Janeiro); Castelnau, Anim. Nouv. Rares Amér. Sud., 1855, 25; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2380.

Blennius filicornis Günther, Cat. Fish. Brit. Mus., III, 1861, 216.

Head 4.75; depth 5.2; D. XII, 21 or 22; A. 23 or 24.

Snout obtuse, its upper profile very oblique; interorbital space flat; no groove or crest on nape; a strong, curved canine in each jaw; orbital tentacle long, with several smaller ones at base; dorsal slightly notched, separate from caudal.

Color brown; cheeks with hexagonal reticulations; sides of body with a few scattered dark dots; basal portion of dorsal and anal pale, both fins darker distally; the margin of anal white.

This species was not taken at Panama, but because of its range it falls within the scope of the present work. The above description was compiled from published accounts of the species.

Known from Florida south to Brazil.

691. Blennius cristatus Linnæus.

Blennius cristatus Linnæus, Syst. Nat., Ed. X, I, 1758, 256 (Indies; after Gronow); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2382, Pl. CCCXXXVIII, fig. 821; Starks, Leland Stanford Jr. Univ. Pub., Univ. Ser., 1913, 75 (Natal); Breder, Zoologica, IV, Pt. 4, 1925, 157 (Caledonia Bay).

Blennius crinitus Cuvier & Valenciennes, Hist. Nat. Poiss., XI, 1836, 237 (La Rochelle, France).

Blennius nuchifilis Cuvier & Valenciennes, Hist. Nat. Poiss., XI, 1836, 253 (Isle of Ascension).

Blennius asterias Goode & Bean, Proc. U. S. Nat. Mus., 1882, 416 (Garden Key, Florida).

"Head 4; depth 4; D. XI, 16; A. 19; maxillary 3. Body moderately elongate, compressed; the head very blunt and deep, almost as deep as long, its anterior profile straight or slightly concave, and nearly vertical. Mouth moderate, the maxillary reaching past front of eye; lower jaw with 2 short stoutish posterior canines, scarcely longer than the front teeth; the upper jaw without canines. Teeth about 32/28. Preorbital deep, its depth equal to diameter of eye and contained 4½ times in length of head. Interorbital space flat, narrow, ⅔ width of eye. Supraocular cirri small, fringed, their length about equal to that of pupil. Nape with a longitudinal dermal crest reaching to front of dorsal, provided with a series of about 20 filaments, the longest about as long as the eye. Gill membranes forming a broad fold across the isthmus, as in all species of *Blennius*. Dorsal nearly continuous, the last spine a little lower than the first soft ray, not very high, beginning on the nape in front of the vertical of the preopercle, the spines all slender and flexible, the longest 3/8 as long as the head, the longest soft ray 4/7 as long as head; caudal free from dorsal and anal; 4/5 as long as head; anal moderate, 4/9 length of head; pectoral somewhat shorter than head; ventral a little more than 1/2 length of head. Lateral line forming the usual arch above pectoral, and continued backward on median line to base of caudal, becoming indistinct posteriorly." (Jordan & Evermann.)

The color is variable. "Some of them are uniform dark brown, nearly black above, and only slightly lighter below, while no cross bars are evident. The fins are all nearly black. Others are very light grayish or slate-color, with about 6 double cross bars on the back and side, and with the fins light or slightly dusky. These two extremes merge into each other, and all of the intermediate shades of color are represented." (Starks.)

This fish, like the preceding, was not seen by us. It, however, has recently been recorded by Breder from Catelonia Bay on the Atlantic coast of Panama.

Apparently a widely distributed species, occurring on the American coast from Florida to Brazil.

260. Genus **Hypsoblennius** Gill.

Hypsoblennius Gill, Proc. Ac. Nat. Sci. Phila., 1861, Suppl., 44 (type *Blennius hentz* Le Sueur).

Isesthes Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1882 (1883), 757 (type *Blennius gentilis* Girard).

Body elongate, compressed; head short; snout very blunt; mouth small, horizontal; teeth in each jaw in a single close-set series, not movable, no canines; gill-openings restricted to the sides; gill-membranes fully united to isthmus; scales entirely wanting; ventrals with 1 short spine and 3 simple rays.

KEY TO THE SPECIES.

a. Dorsal fin continuous, without a notch between the spinous and soft parts, the spines scarcely distinguishable.

b. Caudal fin forked; dorsal rays 33 or 34; anal rays 25 or 26.
minutus sp. nov., p. 943.

bb. Caudal fin rounded.

c. Dorsal rays 28; anal 19 or 20; origin of dorsal over or a little behind posterior margin of eye. *striatus,* p. 944.

cc. Dorsal rays 31 to 33; anal 25 or 26; origin of dorsal over margin of preopercle. *piersoni,* p. 945.

aa. Dorsal fin with a more or less evident notch between the spinous and soft parts.

d. Head very deep, the anterior profile steep; dorsal notch very deep, the rays XI, 11 or 12; anal 15 or 16. *brevipinnis,* p. 946.

dd. Head chubby, anterior profile very steep; dorsal notch shallow, but evident, the rays XII, 14 to 17; anal 17 to 19. *lignus* sp. nov., p. 946.

692. Hypsoblennius minutus sp. nov. (Plate XCVI, fig. 1.)

Type No. 81936, U.S.N.M.; length 32 mm.; Chame Point, Panama.

Head 4.85 to 5.4; depth 5.75 to 6.4; D. 33 or 34; A. 25 or 26.

Body very elongate, slender, compressed; head short, rather broad; snout very short, less than half the length of eye; eye rather large, 2.2 to 2.65 in head; mouth very small, slightly inferior; maxillary scarcely reaching past anterior margin of eye; teeth in a single series, slightly compressed; gill-openings restricted to the sides, rather large, notably broader than base of pectoral, the membranes fully united with the isthmus; lateral line anteriorly prominent, ending a little in advance of tip of pectoral; scales wanting; anterior nostril with a dermal flap on its posterior border; a small, multifid tentacle, half the length of eye, over the eyeball; no tentacles at nape; dorsal fin very long, the spines and rays indistinguishable, and of about even height throughout, its origin a little in advance of margin of opercle; caudal fin short, distinctly forked; anal fin very long and low; ventral fins inserted in advance of pectorals, with 3 distinct rays; pectoral fins long, pointed, reaching notably beyond origin of anal, exceeding the length of head.

Color in specimens at hand, probably faded, uniform pale yellowish; a dark area between eyes and a brownish area a little behind interorbital; an indefinite dark band along margin of preopercle; all the fins except pectorals pale; 4 or 5 series of black spots, composed of 3 or 4 dots each, placed at regular intervals at base of dorsal rays; caudal fin with a dark vertical bar at base; pectoral fins mostly black, the exterior rays pale or punctulate.

This species is represented by 4 specimens, ranging from 27 to 33 mm. in length, collected at Chame Point by Mr. Robert Tweedlie. We have some doubt as to the proper generic disposition of this species, as it appears to mark the transition from *Runula* to *Hypsoblennius*. It has the forked caudal of *Runula* but the 3 distinct articulate ventral rays of *Hypsoblennius*.

693. Hypsoblennius striatus (Steindachner).

Blennius striatus Steindachner, (Sitzb. k. Ak. Wiss. Wien, LXXIV) Ichth. Beitr., V, 1876, 15, Pl. VIII, fig. 4 (Panama).

Isesthes striatus Jordan & Gilbert, Bull. U. S. Fish Comm., II, 1882 (1883), 111.

Hypsoblennius striatus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2388; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 192 (Panama); Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 412 (Panama).

Head 4 to 4.75; depth 3.75 to 5.4; D. XII, 16; A. 19 or 20.

Body elongate, compressed; head short and deep, its anterior profile very steep; snout short, projecting but slightly in advance of forehead, 2.5 to 2.75 in head; eye moderate, placed high, 3.5 to 4.3 in head; interorbital less than half the width of eye; mouth small, terminal; maxillary failing to reach eye, 2.8 to 3.65 in head; teeth in the jaws more or less flattened, incisor-like, close-set, subequal, no canines; opercle and preopercle unarmed; gill-membranes broadly united, forming a slight fold across isthmus; gill-openings restricted to sides; lateral line extending to second cross-bar, absent or appearing as scattered pores posteriorly; a tentacle on upper margin of orbit, varying greatly in length, equal to length of pupil in some specimens, rarely equal to half the length of head; scales wanting; dorsal fin long, its origin over or a little behind posterior margin of eye, the spines very slender, flexible, scarcely distinct from the soft rays; caudal fin round; anal fin about three-fourths the length of the dorsal; ventral fins close together, each with 3 rays and a hidden spine; pectoral fins broad, rounded, 1.05 to 1.25 in head.

Color in life green; back with about 5 dark saddle-like blotches; lower part of side with narrow vertical lines; caudal peduncle with dark spots, forming more or less distinct longitudinal lines; opercle with an indistinct blotch; 2 dark bars below eye, crossing chin; dorsal fin anteriorly with a dark blotch and sometimes with a more or less distinct ocellus between the first and second spines, the distal fourth and occasionally the entire fin with irregular dark markings; caudal fin with irregular dark markings, at least at base; anal fin green at base, becoming dark brown distally, the margin of fin pale, in some specimens the base of each ray with a black spot; ventrals brownish, with the

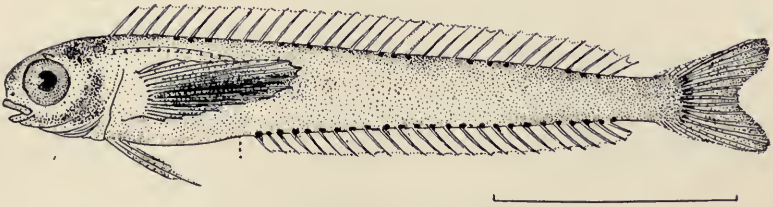

FIG. 1. HYPSOBLENNIUS MINUTUS sp. nov.
Drawn from the type 32 mm. in length.

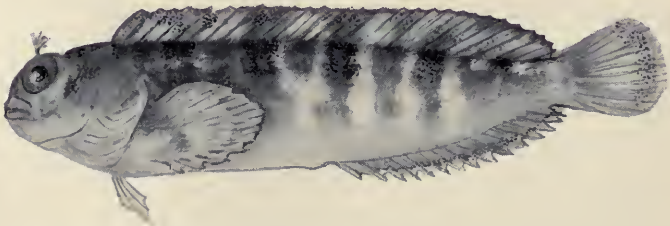

FIG. 2. HYPSOBLENNIUS LIGNUS sp. nov.
From the type 60 mm. in lentgh.

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outer margins pale; pectorals plain brownish or spotted, with narrow pale margin.

This is a common species in the tide pools on the Pacific coast of Panama. Over 100 specimens, ranging from 42 to 70 mm. in length, were preserved.

This species has been reported only from the Pacific coast of Panama. Our specimens are from Chame Point, Balboa and Panama City.

694. Hypsoblennius piersoni Gilbert & Starks.

Hypsoblennius piersoni Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 191, Pl. XXXII, fig. 60 (Panama).

Head 4.5; depth 5.15 to 5.7; D. X, 21 to 23; A. 25 or 26.

Body compressed, rather slender; head short and deep, its anterior profile nearly vertical; snout scarcely in advance of forehead, 3.5 to 4 in head; eye large, 2.8 to 3.1; interorbital about as wide as pupil; mouth small, terminal; maxillary reaching nearly or quite to vertical from anterior margin of pupil, 3.2 in head; teeth in the jaws slightly flattened, close-set, lateral teeth in lower jaw with a minute backward projecting hook, no canines; opercle and preopercle unarmed; gill-openings restricted to sides, not much broader than base of pectoral; gill-membranes joined to the isthmus, failing to form a fold across it; lateral line anteriorly prominent, ending under about the tenth dorsal spine; posterior nostril with a bifurcate tentacle; a long fringed tentacle on upper margin of eye; scales wanting; dorsal fin long, its origin over margin of preopercle, the spines slender, flexible, scarcely distinct from the other rays; caudal fin round; anal fin about two-thirds the length of dorsal; ventral fins small, with 1 short, hidden spine and 3 soft rays; pectoral fins rather broad, 1.2 to 1.35 in head.

Color greenish; back with 6 dark bars; lower part of sides with irregular dark spots, becoming more or less elongate on caudal peduncle; an indistinct dark bar below eye, crossing chin; anterior part of dorsal fin with a black blotch, the rest of fin mostly pale green, with a dusky margin; caudal fin irregularly spotted with dark spots; anal fin greenish, with pale margin and an intramarginal dark bar; ventral fins pale, pectorals with irregular dusky spots.

We have only 2 specimens, respectively 41 and 42 mm. in length. This fish was first reported from Panama by Gilbert & Starks (1904). It appears to be a rare species, occurring in tide pools.

Known only from the Pacific coast of Panama. Our specimens were taken near Balboa.

695. Hypsoblennius brevipinnis (Günther).

Blennius brevipinnis Günther, Cat. Fish. Brit. Mus., III, 1861, 226 (Pacific coast of Central America).

Hypsoblennius brevipinnis Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2390; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 193 (Panama).

Head 3.5 to 4.1; depth 3.3 to 3.9; D. X to XII, 15 or 16; A. II, 13 or 14.

Body rather robust, compressed; head very short and deep, its anterior profile very steep; snout not much in advance of forehead, 2.5 to 3.6 in head; eye 3 to 4; mouth small, transverse, reaching opposite middle of eye, 2.2 to 2.8 in head; teeth in the jaws prominent, close-set, incisor-like, no canines; opercle and preopercle unarmed; gill-opening rather large, notably larger than base of pectoral; the gill-membranes united, forming a distinct fold across the isthmus; lateral line present anteriorly only, ending in advance of origin of soft dorsal; posterior nostril with a broad dermal flap; a rather long slender tentacle with one or two very short branches at base over upper margin of orbit; scales wanting; dorsal fin moderate, its origin over margin of preopercle, a distinct notch between the spinous and soft parts, the soft part being the higher; caudal fin round; anal fin rather short and low; ventral fins inserted slightly in advance of base of pectorals, each with 3 rays; pectoral fins round, 1 to 1.5 in head.

Color brownish; a more or less continuous dark brown lateral band present, broken up into quadrate spots in some specimens; back with 6 or 7 dark bars, these not evident in the darkest colored specimens; a more or less distinct dark spot a short distance behind eye; fins all uniform light brown, except the anal which has a pale margin and a narrow black intramarginal bar.

This species is represented by 72 specimens, ranging in length from 15 to 55 mm.; a lot of 45 of these was sent by Mr. Robert Tweedlie. Our specimens were taken from old submerged wood, in which they appear to inhabit the crevices, and the burrows of the shipworm. When this habit is known the species proves to be rather common.

Known from Mazatlan, Mexico, to Panama. Our specimens were all taken at Chame Point.

696. Hypsoblennius lignus sp. nov. (Plate XCVI, fig. 2.)

Type No. 81937, U. S. N. M.; length 60 mm.; Chame Point, Panama.

Head 3.55 to 3.95; depth 3.9 to 4.4; D. XII, 14 to 16; A. 17 to 19.

Body compressed, rather robust anteriorly; head short, rather broad, its anterior profile convex; snout very short and blunt, 3.75 in head; eye 3 to 3.8; interorbital not much broader than pupil; mouth small, the upper jaw slightly projecting; maxillary reaching to or a little past middle of eye, 2.65 to 2.9 in head; teeth in the jaws compressed, incisor-like, those at sides directed backward at tips; no canines; opercle and preopercle unarmed; gill-opening restricted to side, not much wider than base of pectoral; gill-membranes joined to the isthmus, failing to form a fold across it; lateral line anteriorly prominent, with 2 rows of large pores, ending a little in advance of soft dorsal; head above and at sides with numerous large pores; anterior nostril with a short tube, having a fringed flap posteriorly; upper margin of orbit with a multifid tentacle, varying greatly in length among individuals; scales wanting; dorsal fin with a slight notch, its origin over or slightly behind margin of preopercle; caudal fin round; anal fin rather small; ventral fins inserted much in advance of base of pectorals, anterior to gill-openings, each fin with 3 branched rays; pectoral fins rather short, 1.3 to 1.8 in head.

Color greenish brown; sides with dark cross-bars, these more or less broken on median line of side, extending to edge of abdomen and base of anal, at least in young; head mainly dusky, with or without dark points; chin with about 3 dark cross-bars; dorsal fin pale green, with the dark bars of sides extending across fin; caudal fin plain translucent or more or less dusky; anal fin dusky, with a dark dot at base of each ray in young; ventrals pale or dusky; pectorals more or less greenish dusky; all fins with abruptly pale margins.

This species is represented by 20 specimens, ranging in length from 25 to 70 mm. It may be distinguished from related species by the more chubby head and by the prominent pores on head and nape. The fin counts agree fairly well with those of *H. striatus* but there is a slight notch between the spinous and soft parts of the dorsal, the spines being very distinct, and the fin is inserted a little farther back.

Our specimens are all from Chame Point. They were taken from old submerged wood in company with *H. brevipinnis*. A single specimen was obtained by us, the others were sent by Mr. Robert Tweedlie.

261. Genus **Homesthes** Gilbert.

Homesthes Gilbert, in Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2394 (type *Homesthes caulopus* Gilbert).

Body elongate; head short; mouth rather large; teeth in the jaws in a single close-set series, not movable; no canines; gill-openings restricted to the sides; scales entirely wanting; ventral fins with 1 spine and 4 soft rays. A single species is known.

699. Homesthes caulopus Gilbert.

Homesthes caulopus Gilbert, in Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2394 (Panama Bay); Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 194, Pl. XXXII, fig. 61 (Panama Bay).

Head 3.65 to 4.2; depth 4 to 4.55; D. XII, 15 or 16; A. II, 17.

Body robust, moderately compressed; head heavy, short; snout very short, scarcely in advance of forehead, 3.4 to 4.1; eye 3.65 to 4.35; mouth horizontal, the upper jaw in advance of the lower; maxillary reaching a little beyond middle of eye, 2.6 to 2.9 in head; teeth in each jaw in a single close-set series, more or less incisor-like; gill-openings restricted to the sides, not much longer than base of pectoral; lateral line strongly developed anteriorly, abruptly decurved under posterior third of spinous dorsal, from thence only faintly visible; anterior nostril and upper margin of eye each with a tuft of tentacles; nape and sides of head with many pores, but without tentacles; scales entirely wanting; dorsal fin long, without notch, its origin over margin of preopercle, the soft portion of fin a little higher than the spinous part; caudal short, round; anal with 2 spines, each spine with dermal folds at tip; ventral fins very short; pectoral fins broad, with round margin, 1.5 in head.

Color in alcohol dark brown, with faint dark bars on upper part of sides; a black blotch on side of head behind eye; chin with 3 more or less distinct dark bars; fins all dark brown; median part of anal blackish, the margin white.

This species is known only from Panama. We have 3 specimens, respectively 74, 78 and 79 mm. in length, taken in tide pools at Balboa.

262. Genus **Rupiscartes** Swainson.

Rupiscartes Swainson, Nat. Hist. & Class. Fish., II, 1839, 275 (type *Salarias alticus* Cuvier & Valenciennes = *Blennius tridactylus* Bloch & Schneider).

Body elongate, compressed; head rather short and deep; teeth in the jaws in a single series, one or both jaws with a pair of strong canines; vomer toothless; scales wanting; dorsal fin long, without deep indentation.

698. Rupiscartes atlanticus (Cuvier & Valenciennes).

Salarias atlanticus Cuvier & Valenciennes, Hist. Nat. Poiss., XI, 1836, 321 (Madeira; Antilles).

Rupiscartes atlanticus Jordan, Proc. U. S. Nat. Mus., 1888, 333; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2397, Pl. CCCXXXIX, fig. 825; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 194; Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 405 (Colon).

Blennius atlanticus Fowler, Proc. U. S. Nat. Mus., 1920 (1919), 226 (Colon, Panama; Ascension Island).

Head 4.3; depth 3.8; D. XII, 22; A. 24.

Body rather deep, compressed; head short and deep, with anterior profile vertical; snout very short and blunt; eye moderate, 4 in head; mouth horizontal, inferior; maxillary reaching posterior margin of pupil, 2.7 in head; teeth on the margin of jaws small, movable, close-set, compressed, curved inward at apeces; lower jaw with 2 strong canines placed well behind the outer series of teeth; gill-membranes connected, free from the isthmus; lateral line anteriorly slightly arched, interrupted under anterior rays of soft portion of dorsal, reappearing lower down on side and somewhat in advance of the point of interruption; anterior nostril and upper margin of eyeball each with a fringed tentacle; sides of head and nape with numerous pores; scales entirely wanting; dorsal fin very long, continuous, without indentation; its origin over margin of preopercle; caudal fin round; anal fin moderate, similar to posterior part of dorsal; ventral fins small, equal to length of postorbital part of head; pectoral rather large, 1.05 in head.

Color uniform brownish above, somewhat paler below; sides of head behind eye with a black spot; fins all brownish. Most specimens are said to have 5 or 6 dark cross-bars on sides, extending on the dorsal fin. These bars are, however, not evident on the specimen at hand.

This species was not taken by us. It has been recorded from the Atlantic from the West Indies to Brazil and Ascension Island, and from the Pacific from Mazatlan to Guayaquil, Ecuador, and Chatham Island. It is here described from a single specimen 130 mm. long, from the U. S. National Museum collection, taken at Mazatlan. There appears to be no record of the species on the Pacific coast of Panama, but the species is included because it has been found on the Atlantic coast of Panama and at localities both north and south of the Isthmus on the Pacific coast.

263. Genus **Salarichthys** Guichenot.

Salarichthys Guichenot, Mém. Soc. Sci. Nat. Cherbourg, XIII, 1867, 14 (type *Salarias vomerinus* Cuvier & Valenciennes=*Salarias textilis* Quoy & Gaimard).

Body elongate; head short; snout blunt; mouth rather broad; teeth in the jaws in a single series; a canine on the mandible posteriorly on each side inside of the marginal teeth; vomer with a single row of conical teeth; cirri present at the anterior nostril, over eye, and at nape; scales wanting; dorsal fin deeply notched.

699. Salarichthys textilis (Quoy & Gaimard).

Salarias textilis Quoy & Gaimard, in Cuvier & Valenciennes, Hist Nat. Poiss., XI, 1836, 307 (Ascension Island).

Salarias vomerinus Cuvier & Valenciennes, Hist. Nat. Poiss., XI, 1836, 349 (Bahia).

Salariichthys textilis Jordan, Proc. U. S. Nat. Mus., 1890, 329; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2400; Starks, Leland Stanford Jr. Univ. Pub., Univ. Ser., 1913, 75 (Natal); Breder, Zoologica, IV, Pt. 4, 1925, 157 (Caledonia Bay).

Head 4.6; depth 4.6; D. XII, 16; A. 15.

"The head is short and steeply declivous in front of the eyes, descending in a straight line at an angle of about 70 degrees. The top of the head is horizontal, and the part just above and behind the eyes is broadly rounded. The mouth is inferior, very broad, and more transverse than lateral. Its greatest width is equal to the distance of its corner from the edge of the operculum in a horizontal line. The teeth on the jaws are very fine, in a single row, and very freely movable. There is a canine on each side of the mandible a considerable distance inside of the marginal teeth, its length is about a third of the diameter of the eye. A single row of small conical teeth is on the vomer. There is a multifid barbel at the anterior nostril, on the upper part of each eyeball, and a short simple one at the nape about one diameter of the eye in front of the dorsal. The spinous dorsal is equal in length to the soft dorsal, and the spines are considerably lower than the longest rays. The membrane of the anal fin is deeply incised, and the posterior rays of both the anal and soft dorsal reach to, or beyond, the base of the caudal. The pectoral fin reaches to opposite the front of the anal. The caudal is broadly rounded and very slightly angulated at its outer rays." (Starks.)

"Olive, with 13 silvery cross streaks, not ½ as wide as the dark interspaces, some of the cross streaks Y-shaped; both dorsals with cross markings, the second with 12 or 13 streaks of dark obliquely upward and backward, alternately with similar pale streaks; cross bars on sides bent in middle, extending up and back and down and back from middle line parallel with muscular impressions; sides with some obscure pale dots; caudal barred with 7 dark bars; anal darkest mesially; lower side of head with dark streaks radiating from the isthmus; bars at chin Y-shaped, upper part of head with darker markings; pectoral nearly plain; a dusky area at base below which is a dusky spot; marblings at base of dorsal." (Jordan & Evermann.)

This fish was not seen by us. It, however, has recently been recorded by Breeder from Caledonia Bay on the east coast of the Isthmus.

Known from the Bermudas, the West Indies, Caledonia Bay, and from the coast of Brazil.

264. Genus **Salarias** Cuvier.

Salarias Cuvier, Règne Animal, Ed. I, II, 1817, 251 (type *Salarias quadripennis* Cuvier).

Scartes Jordan & Evermann, Rept. U. S. Fish Comm., XXI, 1895 (1896), 471 (type *Salarias rubropunctatus* Cuvier & Valenciennes; name preoccupied).

Scartichthys Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2395 (type *Salarias rubropunctatus* Cuvier & Valenciennes; substitute for *Scartes,* preoccupied).

Body elongate; head oblong, compressed; snout blunt; eyes lateral, close together; mouth moderate, the upper jaw protruding; teeth in the jaws in a single series, very slender, movable, recurved; no canines; gill-opening continuous under throat, the membranes free from the isthmus; scales wanting; dorsal fin with or without a notch; ventral fins with 3 simple rays.

700. Salarias rubropunctatus Cuvier & Valenciennes.

Salarias rubropunctatus Cuvier & Valenciennes, Hist. Nat. Poiss., XI, 1836, 348 (Juan Fernandez); Günther, Cat. Fish. Brit. Mus., III, 1861, 249; Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882 (1883), 628 (Panama).

Scartichthys rubropunctatus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2396; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 194.

"Head 4; depth 4 (5 with caudal); D. XI-16; A. 20; eye 4⅓ in head; teeth less flexible than in *Rupiscartes atlanticus;* no canine teeth; the forehead not projecting beyond mouth; a very small tentacle on the neck, a longer fringed one above the orbit; dorsal fin deeply notched, not extending on to the caudal.

"Color brown, marbled with black, and dotted with reddish; a black spot on the anterior part of the dorsal; throat with 2 or 3 brownish cross bands; a jet-black spot behind eye, with a narrow edge posteriorly." (Jordan & Evermann.)

This fish was not seen by us. It was once recorded from Panama by Jordan & Gilbert.

Known from Panama to Chile.

265. Genus **Emblemaria** Jordan & Gilbert.

Emblemaria Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882 (1883), 627 (type *Emblemaria nivipes* Jordan & Gilbert).

Body long, slender, compressed, not eel-shaped; head compressed; snout more or less acute; jaws with an outer series of rather strong teeth, a narrow band of villiform teeth behind this series in anterior part of jaws; vomer and palatines with a single series of strong teeth; vomerine and palatine teeth separated by a slight interruption; gill-membranes united, free from the isthmus; lateral line wanting; no scales; no cirri at nape; dorsal fin long, continuous, without notch; ventrals jugular, with I, 2 rays.

KEY TO THE SPECIES.

a. Dorsal fin anteriorly notably elevated, the anterior spines filiform; dorsal formula XXIV, 12; color dark brown, with 8 to 10 vertical bars; caudal fin light at base, its tip blackish. *nivipes*, p. 952.

aa. Dorsal fin anteriorly not notably elevated, none of the spines filiform; dorsal formula XXVII, 11; color uniform dark brown, no bars; caudal fin pale reddish in life, simply translucent in spirits. *nigra* sp. nov., p. 953.

701. Emblemaria nivipes Jordan & Gilbert.

Emblemaria nivipes Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882 (1883), 627 (Pearl Islands, near Panama); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2402; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 194.

Head 3.4; depth 6.5; D. XXIV, 12; A. 25.

Body elongate, slender, compressed; head rather large, compressed, wider than body; snout short, rather acute, 6 in head; eye 4; mouth rather large, terminal, horizontal; maxillary reaching well beyond eye, 2 in head; jaws with an outer series of rather strong teeth, a narrow band of villiform teeth behind this series on anterior part of jaws; vomer and palatines with a series of strong teeth; vomerine and palatine teeth divided by a slight interruption; gill-membranes united, free from the isthmus; lateral line not evident; anterior nostril with a rather broad dermal flap; a slender tentacle on upper margin of eyeball; scales wanting; dorsal fin very long, the anterior portion of fin high, filiform; the posterior rays of the dorsal and anal slightly attached to base of caudal; caudal fin rather short, round; anal fin long and low; ventral fins long and slender; pectoral fins a little shorter than head.

Color dark brown, with 8 to 10 lighter vertical bars, varying in width; under parts lighter; lower part of head with obscure cross-bands; dorsal blackish anteriorly, whitish behind, the membrane at intervals dusky; caudal light at base, its tip blackish; anal dusky translucent; ventrals bright white, the basal portion dusky.

This species was not taken by us. It apparently is recorded only from the Pearl Islands near Panama. We had the privilege of examining the type, a specimen of 48 mm. in length.

702. Emblemaria nigra sp. nov. (Plate XCVII.)

Type No. 81920, U. S. N. M.; length 42 mm.; Porto Bello, Panama.

Head 4.1 to 4.2; depth 7.5 to 8; D. XXVII, 11; A. 26 or 27.

Body long, slender, compressed, the back not much elevated; head rather short, heavy; snout acute, 4.6 to 4.75 in head; eye 4.5 to 4.6; mouth terminal, nearly horizontal; maxillary reaching a little beyond posterior margin of eye, 2.15 to 2.25 in head; teeth in the jaws anteriorly in rather broad bands, reduced to a single series at sides, the outer series somewhat enlarged, extending backward on jaws laterally; vomer and palatines with a single series of conical teeth, the vomerine and palatine teeth divided by a slight interruption; gill-membranes united, free from the isthmus; lateral line wanting; anterior nostril with a single slender cirrus; upper margin of eyeball with a broad fringed cirrus, equal to or slightly longer than eye; scales wanting; dorsal fin very long, continuous, none of the spines filiform, its origin in advance of preopecular margin, with notch or indentation, the spines gradually passing into the soft rays; the posterior rays of the dorsal and anal attached to caudal peduncle by membrane, slightly in advance of base of caudal fin; caudal fin rather short, round; anal fin similar in shape to posterior part of dorsal, without distinct spines; ventral fins inserted in advance of pectorals, short, about half the length of head; pectoral fins rather short, 1.75 to 1.8 in head.

Color in life uniform dark brown; caudal, the posterior part of dorsal and anal, and pectorals pale reddish; fins otherwise black.

This species is represented by 2 specimens, 42 and 43 mm. in length, taken at Porto Bello.

Family LXXXII. **Cerdalidæ.**

Body elongate, compressed; head short; gill-openings reduced to small slits, more or less horizontal in position; branchiostegals prominent; pseudobranchiæ well developed; scales small, rudimentary; lateral line wanting; dorsal fin very long and low, anteriorly with slender spines, these passing gradually into the soft rays, no free spines; ventral rays I, 3; no cirri; tail not isocercal.

"The presence of some spines in the dorsal separates them from the *Scytalinidæ,* while the small gill openings distinguish them from the *Blenniidæ,* to which they are more nearly allied." (Jordan & Evermann.)

KEY TO THE GENERA.

a. Body very elongate; vertebræ about 58 to 63. *Microdesmus,* p. 954.

aa. Body much less elongate; vertebræ about 43. *Cerdale,* p. 958.

266. Genus **Microdesmus** Günther.

Microdesmus Günther, Proc. Zoöl. Soc. London, 1864, 26 (type *Microdesmus dipus* Günther).

Body very elongate, slender; vertebræ numerous, about 58 to 63; head short; snout obtuse; mouth small; vertical fins well developed, the dorsal and anal joined to the caudal by a membrane; ventral fins small, with I, 3 rays; pectorals moderate; vent near middle of body.

KEY TO THE SPECIES.

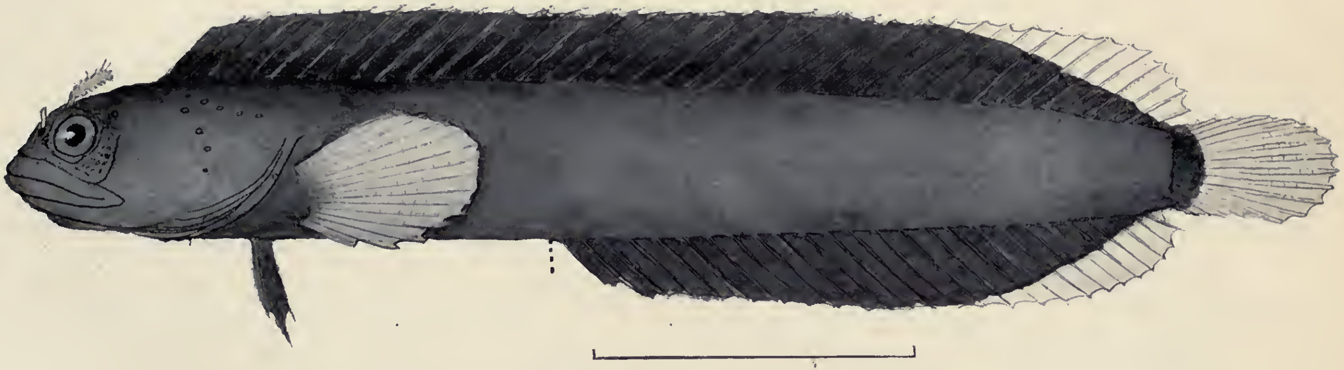
a. Dorsal rays 47 to 49; anal rays 30 or 31; pectoral rays 10; color in spirits brownish, upper part of sides with 2 rows of brownish, quadrate spots. *retropinnis,* p. 955.

aa. Dorsal and anal fins longer; the dorsal with 55 to 78 rays; anal with 38 to 61 rays; pectoral rays 12; color uniform pale olivaceous, without spots or other markings.

b. The tail without caudal fin shorter than rest of body, its length to tip of caudal fin 1.9 in body; snout pointed; lips thin, without definite folds or ridges; D. 69; A. 43; head 10.3; depth 17.8. *affinis* sp. nov., p. 955.

bb. Tail without caudal fin notably longer than rest of body, its length to tip of caudal fin 1.45 to 1.6 in body; snout broad, blunt; the lips thick, with evident longitudinal folds or ridges.

c. Dorsal rays 55; anal rays 38; body slender, the depth 20.8; head 10.4. *dipus,* p. 956.



Emblemaria nigra sp. nov.
Drawn from the type 42 mm. in length.

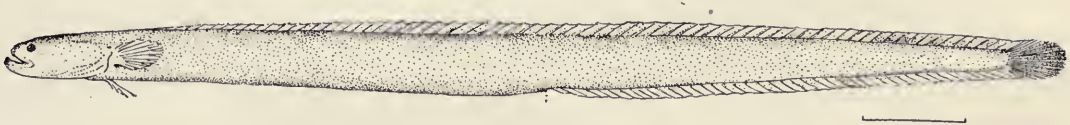


FIG. 1. MICRODESMUS AFFINIS sp. nov.
Drawn from the type 105 mm. in length.

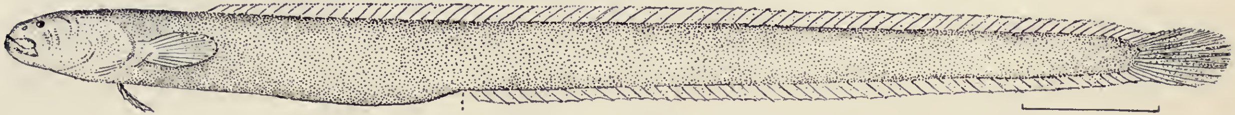


FIG. 2. MICRODESMUS INTERMEDIUS sp. nov.
Drawn from the type 90 mm. in length.

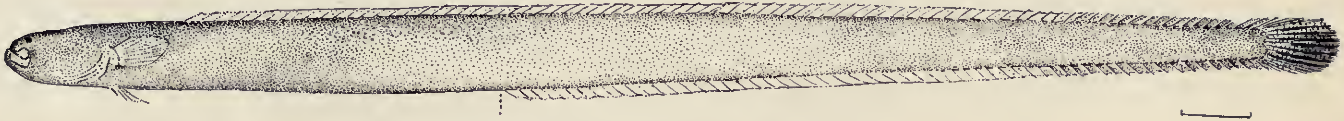


FIG. 3. MICRODESMUS MULTIRADIATUS sp. nov.
Drawn from the type 200 mm. in length.

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cc. Dorsal rays 66 to 68; anal rays 45 to 52; body deeper, the depth 13.4 to 16.5; head 7.75 to 8.3. *intermedius* sp. nov., p. 957.

ccc. Dorsal rays 74 to 78; anal rays 55 to 61; body very slender, the depth 21.1 to 22.8; head 10.1 to 11.85. *multiradiatus* sp. nov., p. 958.

703. **Microdesmus retropinnis** Jordan & Gilbert.

Microdesmus retropinnis Jordan & Gilbert, Bull. U. S. Fish Comm., I, 1881 (1882), 331 (Panama); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2450; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 195, Pl. XXXI, fig. 59 (Panama).

Head 11.4 to 13.5; depth 12 to 16.5; D. 47 to 49; A. 30 or 31.

Body very elongate, somewhat compressed, eel-shaped; head short, small, tapering; snout very short, 4.3 to 5.35 in head; eye very small, 7.5 to 8.65; mouth small, the gape scarcely reaching anterior margin of eye; lower jaw strongly projecting; teeth rather strong, conic, apparently in narrow bands in each jaw; gill-opening very small, scarcely as long as snout; scales very small; dorsal fin long and low, scarcely distinct from the caudal, its origin nearly twice the length of head behind head; caudal fin rounded, as long as head; anal fin similar to dorsal, but only a little more than half as long; ventral fins small, inserted at the throat under base of pectorals, with I, 3 rays; pectoral fins small, 2.3 to 3.25 in head, 10 rays.

Color in spirits slightly brownish above, pale below; upper part of sides with 2 rows of quadrate brownish spots; the spots of the upper row on anterior part of body usually united on the median line of the back and separated from the succeeding ones by pale cross-bars formed by the ground color of the body; the sides of head and chin indefinitely spotted with brown; the spots of the upper row slightly extended on the base of the dorsal fin; fins otherwise plain translucent.

This species is represented by 3 specimens, respectively 85, 99 and 109 mm. in length, collected in rocky tide pools.

Known only from Panama Bay. Our specimens were collected at Chame Point, Balboa and Panama.

704. **Microdesmus affinis** sp. nov. (Plate XCVIII, fig. 1.)

Type No. 84300, U. S. N. M.; length 105 mm.; Chame Point, Panama.

Head 10.3; depth 17.8; D. 69; A. 43.

Body elongate, compressed; the tail rather short, its length to tip of caudal fin only slightly longer than rest of body, 1.9 in standard length; head small; snout pointed, 4.75 in head; eye minute, placed high, lateral; interorbital space narrow; mouth small, oblique, the gape reaching anterior margin of eye; the lower jaw strongly projecting, hooked at the tip; the lips thin and without definite folds; teeth apparently placed as in related species but not quite as strong; gill-opening a little longer than width of base of pectoral; scales small, embedded and not imbricated; myomeres, or muscular rings, evident, about 31 in the tail; dorsal fin long and low, its origin over tips of pectorals, confluent with the base of upper rays of caudal fin; caudal fin short, rounded, not more than ¾ length of head; anal fin similar to the dorsal but shorter, confluent with the caudal; ventral fins small, notably shorter than the pectorals, I, 3 rays; pectoral fins moderate, 1.9 in head, rays 12.

Color of preserved specimen, uniform olivaceous; the caudal fin slightly dusky; other fins plain translucent.

A single specimen, 105 mm. long, forms the basis for the above description and the type of the species. This species is related to *M. intermedius,* from which it, however, differs in having a shorter and narrower head, a much more pointed snout, thinner lips, and proportionately shorter caudal fin. It differs notably from all the other species of the genus, except *M. retropinnis,* in the short tail, which without the caudal fin is shorter than the rest of the body. From *M. retropinnis* it is, of course, readily distinguished by the more numerous rays in the dorsal and anal fins and by the color.

The single specimen was taken at Chame Point by Mr. Robert Tweedlie.

705. Microdesmus dipus Günther.

Microdesmus dipus Günther, Proc. Zoöl. Soc. London, 1864, 26, Pl. III, fig. 2 (Central America); Lockington, Proc. Ac. Nat. Sci. Phila., 1881, 114 (La Paz, Lower Cal.); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2450; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 195.

Head 10.4; depth 20.8; D. 55; A. 38.

Body elongate, compressed; the tail long, its length to tip of caudal fin 1.6 in standard length; head short; snout very short and rather blunt, 4 in head; eye very small, placed high, lateral; interorbital rather broad, the space between the eyes about equal to length of snout; mouth small, oblique, the gape reaching about to anterior margin of eye; the lower jaw projecting; the lips fleshy, with long longitudinal folds; teeth rather strong, as in *M. retropinnis;* gill-opening not much longer than width of base of pectoral; scales small, embedded, not imbricated; myomeres, or muscular rings, evident, about 33 in the tail; dorsal fin of moderate length, confluent with the caudal fin, its origin over tips of pectorals; caudal fin rather long, rounded, nearly as long as head; anal fin similar to dorsal but shorter, confluent with the caudal fin; ventral fins small, about ¾ the length of pectorals, I, 3 rays; pectoral fins moderate, 1.8 in head, 12 rays.

Color of preserved specimen uniform olivaceous; the caudal fin dark brown; all other fins plain translucent.

A single specimen, 115 mm. long, forms the basis for the above description. This specimen does not agree in all details with the description of the type of the species, but these differences may be due to individual variation. The error in the enumeration of the ventral rays in the type, given as 1, has already been pointed out by Gilbert and Starks.

A rare species, known heretofore only from the type from Panama and from a record by Lockington from La Paz, L. C. Our specimen was taken by Mr. Robert Tweedlie at Chame Point.

706. Microdesmus intermedius sp. nov. (Plate XCVIII, fig. 2.)

Type No. 84301, U. S. N. M.; length 90 mm.; Chame Point, Panama.

Head 7.75 to 8.3; depth 13.4 to 16.5; D. 66 to 68; A. 45 to 52.

Body elongate, compressed; the tail long, its length to tip of caudal 1.45 to 1.5 in standard length; head rather larger than in related species; snout very blunt, 4.25 to 5.75 in head; eye minute, placed high; interorbital space rather broad, not quite equal to length of snout; mouth small, quite oblique, the gape reaching nearly to anterior margin of eye; the lower jaw projecting; lips rather thick, with longitudinal fleshy folds; teeth quite strong, as in *M. retropinnis;* gill-opening a little longer than width of base of pectoral; scales small, embedded; myomeres, or muscular rings, evident, 35 to 38 in tail; dorsal fin long, its origin over tips of pectorals, confluent with the base of caudal rays; caudal fin rather long, not much shorter than head; anal fin similar to dorsal but shorter, confluent with the caudal fin; ventral fins quite small, about ⅘ the length of the pectorals, rays I, 3; pectoral fins moderate, 1.7 to 2.5 in head, 12 rays.

Color of preserved specimens uniform pale olivaceous; the caudal fin dusky; other fins plain translucent.

This species is represented by 3 specimens, respectively 75, 90 and 105 mm. in length. It differs from *M. dipus* in having a somewhat deeper body, larger head, and more numerous rays in the dorsal and anal fins. It is intermediate between *M. dipus* and *M. multiradiatus* in the number of dorsal and anal rays.

The specimens of this new form were all collected at Chame Point by Mr. Robert Tweedlie.

707. Microdesmus multiradiatus sp. nov. (Plate XCVIII, fig. 3.)

Type No. 82682, U. S. N. M.; length 200 mm.; Chame Point, Panama.

Head 10.1 to 11.85; depth 21.1 to 22.8; D. 74 to 78; A. 55 to 61.

Body slender, compressed, eel-shaped; the tail very long, its length to tip of caudal fin 1.45 to 1.5 in standard length; head short; snout very short and blunt, 3.75 to 4.55 in head; eye very small, placed high, about 22 in head; mouth oblique, the lower jaw broad, projecting; the gape not quite reaching anterior margin of eye; the lips with fleshy folds; teeth rather strong, apparently in narrow bands; gill-opening small, scarcely as long as snout; scales small, not imbricated; myomeres prominent, 40 to 43 in the tail; dorsal fin long and low, confluent with the caudal, its origin over tips of pectorals; caudal fin round or slightly pointed, about as long as head; anal fin scarcely as high as the dorsal, confluent with the caudal fin at base; ventral fins small, shorter than pectorals, inserted under base of pectorals, I, 3 rays; pectoral fins short, 1.7 to 2.45 in head, 12 rays.

Color uniform olivaceous or brown; the caudal fin often slightly dusky.

This species is represented by 34 specimens, ranging in length from 85 to 210 mm. The species differs from the other forms in the more slender body and more numerous rays in the dorsal and anal fins. The difference in depth is most noticeable in the caudal portion of the body.

The specimens at hand were all collected at Chame Point by Mr. Robert Tweedlie.

267. Genus **Cerdale** Jordan & Gilbert.

Cerdale Jordan & Gilbert, Bull. U. S. Fish Comm., I, 1881 (1882), 332 (type *Cerdale ionthas* Jordan & Gilbert).

This genus differs from *Microdesmus* only in the much shorter body and fewer vertebræ, which number about 43. A single species of the genus is known.

708. Cerdale ionthas Jordan & Gilbert.

Cerdale ionthas Jordan & Gilbert, Bull. U. S. Fish Comm., I, 1881 (1882), 332 (Panama); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2449; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 196, Pl. XXXI, fig. 58 (Panama).

Head 7; depth 8.15; D. 44; A. 29.

Body moderately elongate, compressed; head short; snout blunt, 5.6 in head; eye 7; mouth small, oblique, the lower jaw strongly projecting; teeth present on jaws, more or less definitely in 2 series on each jaw; scales small, covering body and head; vent situated a little nearer tip of snout than base of caudal; dorsal fin long, continuous, its origin a little in advance of tip of pectorals, separate from the caudal; caudal fin slightly rounded, shorter than head; anal fin similar to the dorsal, but shorter, its origin somewhat in advance of the vertical from middle of dorsal; ventral fins small, I, 3 rays, inserted below base of pectorals, their length equal to length of snout and eye; pectoral fins moderate, inserted just above and behind the very small gill-opening, 1.75 in head.

Color in alcohol brownish above, pale below; the head and sides with small dark brown spots, these forming indefinite cross-bars on chin; the dorsal fin with small brown spots; other fins unmarked.

A single specimen 56 mm. long was taken from a tide pool on Panama Reef. Prof. Gilbert and associates secured 18 specimens on Panama Reef in 1896. A few mistakes which appeared in the original and subsequent descriptions were corrected by Gilbert & Starks.

Known only from Panama Reef. Our specimen is from a rocky pool near Panama .

Family LXXXIII. Ophidiidæ.

THE CUSK EELS.

Body elongate, compressed, more or less eel-shaped; head large; lower jaw included; both jaws, and usually vomer and palatines, with villiform or cardiform teeth; premaxillaries protractile; gill-openings wide, the membranes separate, anteriorly narrowly joined to the isthmus behind ventrals; pseudobranchiæ small; gills 4, a slit behind the fourth; scales small, covering body, and occasionally the head; air bladder and pyloric cæca present; vertical fins low, without spines, confluent around the tail; tail isocercal; ventral fins at the throat, each developed as a long, forked barbel. Two genera of this family come within the scope of the present work.

KEY TO THE GENERA.

a. Head scaly, at least above; scales well developed, imbricated; snout usually with a spine at tip. *Lepophidium*, p. 960.

aa. Head scaleless; scales on body rudimentary, scarcely imbricate; opercle ending in a spine concealed in the skin. *Otophidium*, p. 961.

268. Genus **Lepophidium** Gill.

Leptophidium Gill, Proc. Ac. Nat. Sci. Phila., 1863, 210 (type *Leptophidium profundorum* Gill; name preoccupied in reptiles).

Lepophidium Gill, Amer. Naturalist, XXIX, 1895, 167 (type *Leptophidium profundorum* Gill; substitute for *Leptophidium*, preoccupied).

Body elongate, compressed; the back somewhat elevated, slowly decreasing in height backward to the point of tail; head rather large; snout prominent, usually armed with a spine or hook anteriorly (absent in one species); teeth present on jaws, vomer and palatines; scales small, imbricated, with radiating striæ, extending forward on head and cheeks; dorsal and anal confluent around the tail; ventral fins attached to throat. A single species is represented in the Panama collection, taken at Balboa on the Pacific coast. Another species, which is so imperfectly described that we will not attempt to give its relationship, may be expected on the Atlantic coast.*

709. **Lepophidium prorates** (Jordan & Bollman).

Leptophidium prorates Jordan & Bollman, Proc. U. S. Nat. Mus., 1889, 172 (Panama).

Lepophidium prorates Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2485; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 196.

Head 4.9; depth 8.9; scales about 200.

Body elongate, more or less compressed; the tail very long, tapering, approximately twice as long as rest of body; head nearly as broad as deep; snout projecting, with a well developed spine directed forward at tip, 4 in head; eye 4.65; interorbital 6.3; mouth large, horizontal; maxillary reaching vertical from posterior margin of eye, 2.35 in head; teeth in bands, present on jaws, vomer and palatines, rather bluntly pointed, those on vomer and palatines more so than the jaw teeth; gill-rakers rather short and slender, 4 developed on lower limb of first arch; scales small, striated, somewhat covered with skin, present on postorbital part of head and cheeks; lateral line present, running high; dorsal and anal rather low, confluent around the tail; origin of dorsal over middle of pectorals; ventral fins inserted under chin, consisting of 2 filaments each; pectoral fins moderate, 2.2 in head.

Color in alcohol brownish above, pale below; dorsal and anal fins pale at base, with a broad black border; pectorals and ventrals plain.

A single specimen, 150 mm. length, is represented in the Panama collection. This species was previously known only from the type and cotypes.

Recorded only from Panama Bay. Our specimen is from Balboa.

710. Lepophidium brevibarbe (Cuvier).

Ophidion brevibarbe Cuvier, Règne Animal, Ed. II, II, 1829, 358 (Brazil).

Lepophidium brevibarbe Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2485.

This species is imperfectly described and its relationship is not understood, but it is probably close to *L. prorates*.

A short decurved spine on the point of the snout. Teeth strong; occiput and gill-covers scaly. Vertical fins edged with black. (Kaup.) Air bladder oblong ovate, without contracted portion and without posterior foramen; no single anterior bone, replaced by a cartilage. (Müller.)

This fish was not seen by us. It is recorded from the West Indies and Brazil, therefore falling within the range of the present work.

269. Genus **Otophidium** Gill.

Otophidium Gill, in Jordan, Rept. U. S. Fish Comm., XIII, 1885 (1887), 914 (type *Genypterus omostigma* Jordan & Gilbert).

Body moderately elongate, compressed; teeth villiform on jaws, those of the outer series more or less enlarged, none of them movable; teeth on vomer and palatines bluntish, some of them enlarged; scales small, usually not imbricated, but arranged in short, oblique series, often placed at right angles to each other; head naked; opercle ending in a concealed spine; sometimes a distinct spine at tip of snout; air bladder short, thick and with a large foramen. A single species of the genus, although not obtained by us, falls within the scope of the present work.

718. Otophidium indefatigabile Jordan & Bollman.

Otophidium indefatigabile Jordan & Bollman, Proc. U. S. Nat. Mus., 1889, 172 (Indefatigable Island, Galapagos Archipelago); Gilbert, Proc. U. S. Nat. Mus., 1890, 453 (Panama Bay, Albatross Station

2797); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2490.

"Head 4⅗ (4½ in total); depth 5⅔ (5 6/7); eye large, 3 in head; snout 4. Body rather short, compressed, width of nape 2½ in head. Mouth large; maxillary reaching to opposite posterior margin of pupil, 1⅘ in head; outer row of teeth of each jaw very slightly enlarged. Interorbital space 2 in eye; interorbital area with a thin crest under skin, this ending in two compressed spines, 1 turning forward, the other backward over front of eye, these spines concealed by the skin. Gill rakers short and thick, less than ½ pupil, 4 developed. Dorsal beginning at end of anterior third of pectorals, longest ray 3½ in head; pectorals 2 in head; inner ventral filament longest, 2 in head. Air bladder short and thick, with a foramen. Scales very small, more or less imbricated on body; head naked. Opercle with a sharp, partly concealed spine. Pseudobranchiæ present. Color pale yellowish brown, silvery on belly and sides of head; back with about 12 irregular dark cross bands, the alternate ones being narrower and broken up into spots, 2 before dorsal; a few scattered spots about as large as pupil on sides, these most distinct about the shoulder; dorsal pale, first rays black, and with 3 or 4 other black blotches on upper part; anal black, margined with white; pectorals pale, axil dusky; caudal and posterior part of anal pale; chin pale." (Jordan & Evermann.)

This fish was not seen by us. It was once recorded from Panama Bay.

Known from Panama Bay and the Galapagos Archipelago.

Family LXXXIV. Carapidæ.*

THE PEARL-FISHES.

Body elongate, compressed, tapering into a long slender tail; mouth rather large, the lower jaw included; teeth rather strong, present on both jaws, vomer and palatines; gill-membranes little or not at all united, free from the isthmus; vent at the throat; dorsal and anal very low; pectoral fins present or absent; ventral fins wanting. The small eel-like fishes of this family are not well known. The name pearl fishes originated from the fact that some of the species, at least, live in shells of mollusks, echinoderms, etc. A valve of a pearl oyster in the Museum of Comparative Zoölogy, Cambridge, Mass., for example, is reported to

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*This family is given under the name *Fierasferidæ* in the "Key to the Families" in Part I, p. 26, of the present work.

have a specimen of *Carapus dubius* beautifully enclosed in a pearly covering, deposited by the oyster.

KEY TO THE GENERA.

a. Body moderately robust, nearly or quite as deep as head; no spinous filament at nape. *Carapus*, p. 963.

aa. Body very slender, not nearly as deep as head; a spinous filament at nape. *Leptofierasfer* gen nov., p. 964.

270. Genus **Carapus** Rafinesque.

Carapus Rafinesque, Ind. d'Itt. Sicil., etc., 1810, 37, 57 (type *Gymnotus acus* Linnæus, as approved by Intern. Comm. Zoöl. Nomenc.).

Fierasfer Cuvier, Mém. Mus. Hist. Nat. Paris, I, 1815, 119, 312, 359 (type *Ophidion imberbe* Linnæus).

Echiodon Thompson, Proc. Zoöl. Soc. London, 1837, 55 (type *Echiodon drummondii* Thompson).

Diaphasia Lowe, Proc. Zoöl. Soc. London, 1843, 92 (type *Gymnotus acus* Brünnich).

Oxybeles Richardson, Voy. Erebus & Terror, Ichth., 1844, 74 (type *Oxybeles homei* Richardson).

Porobronchus Kaup, Ann. & Mag. Nat. Hist., Ser. 3, VI, 1860, 272 (type *Porobronchus linearis* Kaup).

Vexillifer Gasco, Bull. Assoc. Nat. Med. Napol., 1870, 59 (type *Vexillifer dephilippii* Gasco).

Lefroyia Jones, Zoölogist, II, 1874, 3837 (type *Lefroyia bermudensis* Jones).

Body elongate, compressed, with a long slender tail; vent at throat; gill-membranes little connected or separate; no evident caudal fin; no filament at nape.

712. Carapus dubius (Putnam).

Fierasfer dubius Putnam, Proc. Boston Soc. Nat. Hist., XVI, 1873-4 (1874), 344 (Pearl Islands); Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 197 (Panama Bay).

Fierasfer affinis Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2495.

Head 7.5 to 9.1; depth 10 to 14.5.

Body moderately elongate, compressed; the tail long, tapering to a sharp point; head rather large, not deeper than body; snout blunt, 4.2 to 6.2 in head; eye 3.2 to 4.15; mouth large, a little oblique; maxillary reaching beyond eye, 1.5 to 1.95 in head; teeth in the jaws and on palatines in bands, some of the anterior teeth in upper jaw enlarged, some of the lateral teeth in lower jaw enlarged, canine-like, bent backward; vomer with a median row of enlarged teeth surrounded by small villiform teeth; gill-membranes slightly connected; vent at throat; dorsal very low, somewhat lower than anal, its origin about twice the length of head behind tip of snout; no distinct caudal fin; origin of anal under base of pectorals; ventral fins wanting; pectoral fins well developed, pointed, 1.45 to 2 in head.

Color of preserved specimens uniform light brown.

This form was not taken by us, but it is recorded from Panama Bay by Gilbert & Starks. The species was originally described from the Pearl Islands near Panama. The above description is based on 7 specimens in the National Museum, ranging in length from 73 to 110 mm. Two of the specimens at hand are from the Pacific coast, from Colima, Mexico, the others are from the Atlantic, from the Bahama Islands, Porto Rico and Cuba. We are unable, with the meager material at hand (the specimens from the Pacific being poorly preserved), to determine definitely whether or not the representatives from the opposite coast are identical, but the mouth in the Pacific coast specimens appears to be a little larger and the teeth on the vomer smaller.

Known from Lower California to Panama Bay on the Pacific coast and on the Atlantic from Florida, Bermuda, Bahamas and the West Indies. It has not as yet been found on the Atlantic coast of Panama.

271. Genus **Leptofierasfer** gen. nov.

Type *Leptofierasfer macrurus* sp. nov.

Body extremely slender, compressed; the tail long, filamentous; head short, strongly compressed; gill-membranes separate; a prominent spinous filament inserted at nape.

713. Leptofierasfer macrurus sp. nov. (Plate XCIX, fig. 1.)

Type No. 82685, U. S. N. M.; length 95 mm.; Chame Point, Panama.

Head 21 to 27 in total length; depth of head 30 to 38.

Body very slender, compressed, with a long, slender, filamentous tail; head deeper than rest of body, strongly compressed; snout blunt, projecting slightly beyond the mouth, 3 to 4.7 in head; eye well developed, as long as snout; mouth oblique; maxillary reaching slightly beyond middle of eye, 1.8 to 2.2 in head; gill-membranes apparently separate and free from the isthmus; branchiostegals 5 or 6; a long slender filament, longer than the head, on nape, inserted slightly behind

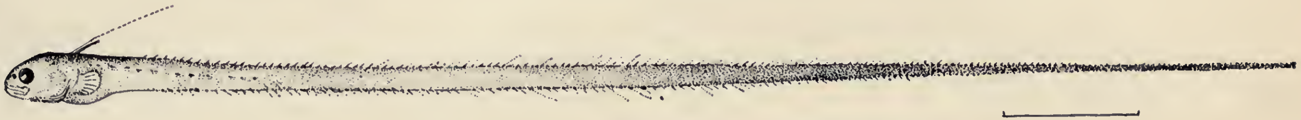

FIG. 1. **LEPTOFIERASFER MACRURUS** gen. et sp. nov.
Drawn from the type 95 mm. in length.

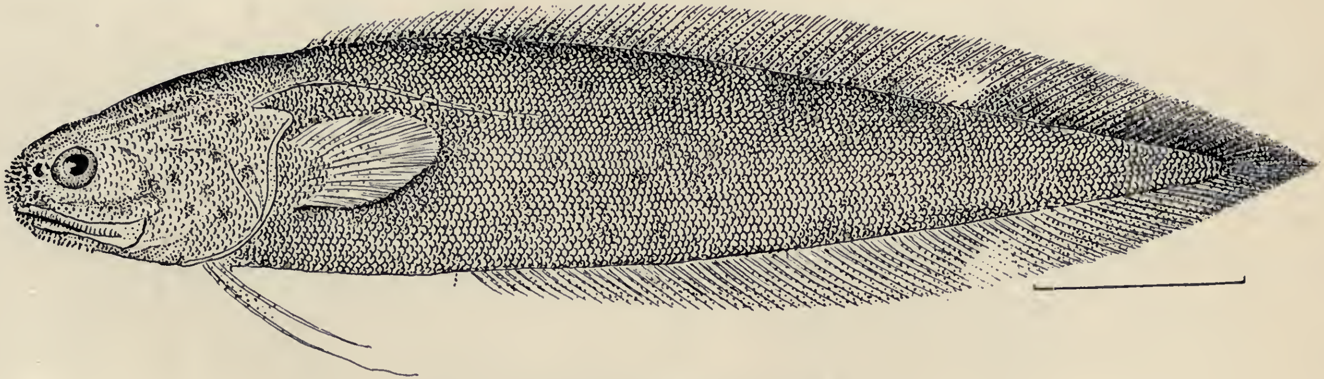

FIG. 2. **PSEUDOBYTHITES SANGUINEUS** gen. et sp. nov.
Drawn from the type 60 mm. in length.

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vertical from base of pectorals, preceded by a median groove; vent at throat; exact origin of dorsal indistinct, beginning at a point about twice the length of head from occiput; anal fin beginning a little behind tips of pectorals, a little higher and more distinct than the dorsal, the fins becoming indistinct on the long filamentous caudal; pectoral fins close behind gill-openings, not much longer than the snout.

Color of preserved specimens uniform pale.

There are 4 specimens of this species at hand, ranging from 85 to 110 mm. in length, collected by Mr. Robert Tweedlie at Chame Point, and they appear to represent a new genus and species. The body is much more slender than it is in the other forms of the family, the head is short and more strongly compressed, teeth appear to be wanting in the jaws and on vomer, the tail is filamentous and there is a long filament present at the nape. The filament at the nape is easily broken, and it is lost from 3 of our specimens, only the base remaining.

Family LXXXV. **Brotulidæ.**

Body elongate, compressed, regularly tapering posteriorly; tail usually not isocercal; vent submedian; gill-openings very large, the membranes mostly free from the isthmus; scales small, more or less embedded; vertical fins united or contiguous at base of caudal; the origin of dorsal not far behind nape; ventral fins small, few rayed, attached to humeral arch, somewhat in advance of pectorals. Most of the representatives of this family live in the deep sea. A few of the species have degenerated into blind cave fishes and several are occasionally found along the sea shores. The Panama collection contains 2 genera and 3 species.

KEY TO THE GENERA.

a. Caudal fin differentiated, on a distinct caudal peduncle. *Ogilbia,* p. 965.

aa. Caudal fin confluent with the dorsal and anal, no distinct caudal peduncle. *Pseudobythites* gen. nov., p. 968.

272. Genus **Ogilbia** Jordan & Evermann.

Ogilbia Jordan & Evermann, in Evermann & Kendall, Bull. U. S. Fish Comm., XVII, 1897 (1898), 132 (type *Ogilbia cayorum* Evermann & Kendall).

Body moderately elongate; opercle with a single flat spine; preopercle unarmed; no barbels or cilia present; teeth pointed, in bands on jaws, vomer and palatines; scales small, embedded, covering body and sides of head; caudal fin free from the dorsal and anal; ventral fins inserted in advance of pectorals, composed of two slender filaments.

KEY TO THE SPECIES.

a. Scales very small, obscure, about 110 in lateral series; snout short, 4.4 to 5.5 in head. *ventralis*, p. 966.

aa. Scales somewhat larger and more distinct, about 90 in lateral series; snout longer, 4 in head. *cayorum*, p. 967.

714. Ogilbia ventralis (Gill).

Brosmophycis ventralis Gill, Proc. Ac. Nat. Sci. Phila., 1863, 253 (Cape San Lucas).

Dinematichthys ventralis Jordan, Proc. Cal. Ac. Sci., 2nd Ser., V, 1895, 502, Pl. LIV.

Ogilbia ventralis Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2503, Pl. CCCLV, fig. 872; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 197 (Panama).

Head 4.1 to 4.35; depth 5 to 5.65; D. 62 to 75; A. 48 to 60; scales about 110.

Body elongate, compressed; head moderate; snout blunt, 4.4 to 5.5 in head; eye small, 8.7 to 10.5; interorbital convex, 4.6 to 6.5; mouth rather large, terminal, nearly horizontal; maxillary reaching far beyond eye, 1.8 to 1.9 in head; tip of snout and tip of lower jaw with prominent dermal ridges; teeth pointed, present on jaws, vomer and palatines; opercle with a single flat spine, placed a little above level of eye; gill-rakers poorly developed, represented by 3 tubercles on the lower limb of first arch; scales very small, embedded, very difficult to enumerate, covering entire body and sides of head; lateral line obsolete; dorsal fin long, continuous, its origin a little behind base of pectorals; caudal fin entirely distinct from dorsal and anal, rounded; anal fin similar to dorsal but shorter, its origin equidistant from tip of snout and base of caudal; ventral fins composed of 2 slender rays, inserted close together under margin of preopercle; pectoral fins rather short, rounded, 1.8 to 2 in head.

Color in spirits plain brownish above, paler below; dorsal and caudal brownish at base, the fins otherwise pale.

The present collection contains 3 specimens, respectively 50, 50 and 61 mm. in length, taken on rocky bottom.

Known from Mazatlan to Panama. Our specimens are from near Balboa.

715. Ogilbia cayorum Evermann & Kendall.

Ogilbia cayorum Evermann & Kendall, Bull. U. S. Fish Comm., XVII, 1897 (1898), 133, Pl. IX, fig. 14 (Key West, Fla.); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2503, Pl. CCCLV, fig. 873; Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 405 (Toro Point).

Head 4.6; depth 4.6; D. about 65; A. about 55; scales about 90.

Body elongate, compressed; head moderate; snout rather blunt, 4 in head; eye small, 9.2; interorbital convex, 4.3; mouth large, terminal, nearly horizontal; maxillary reaching far beyond eye, 1.7 in head; tip of snout and tip of mandible with dermal ridges; teeth pointed, in bands on jaws, vomer and palatines; opercle with a single flat spine, placed slightly above level of eye; gill-rakers obsolete; scales small, thin, embedded, very difficult to enumerate, covering entire body and sides of head; lateral line obsolete; dorsal fin long, continuous, its origin a little behind base of pectorals; caudal fin entirely distinct from dorsal and anal, rounded; anal fin similar to dorsal, but shorter, its origin equidistant from snout and base of caudal; ventral fins inserted close together, under margin of preopercle, consisting of two slender rays, reaching half the distance from their origin to vent; pectoral fins rather broad, posterior margin round, 1.7 in head.

Color in life brownish red above, pale red below; region about mouth brick-red; fins all bright red; the vertical fins with pale red margins.

We have a single specimen, 62 mm. long, from the Atlantic coast of Panama, which we refer to this species. The prominent dermal folds and ridges on the tip of snout and mandible on the specimen at hand are not mentioned in the original description nor shown in the drawing of the type. We, however, have examined the type and find them present, but not quite as prominent. We have compared our specimen with 3 specimens of *O. ventralis* from the Pacific coast, contained in the present collection, and we find that they are very similar. Our material is too meager to establish definitely the relationship, but it seems probable that the scales of the Atlantic specimen are a little larger, and the snout and maxillary a little longer. Since the scales cannot be definitely seen or enumerated, this character must not be too strongly relied upon. A study of more specimens is necessary to determine the affinities.

Known only from Key West and Panama. Our specimen is from Toro Point.

273. Genus **Pseudobythites** gen. nov.

Type *Pseudobythites sanguineus* sp. nov.

This genus is close to *Neobythites* Goode & Bean, from which it, however, differs in having both the opercle and preopercle unarmed. The eye is very small; the snout and mandible are covered with short dermal flaps; both lips have prominent vertical folds which form slight papillæ along the edges of the mouth; and the ventral fins are very close together, consisting of 2 rays each and inserted at the isthmus, almost on the humeral symphysis. The body is elongate, compressed; teeth small, in bands on jaws, vomer and palatines; gill-membranes separate, free from the isthmus; scales small, present on head and body; vertical fins confluent.

716. Pseudobythites sanguineus sp. nov. (Plate XCIX, fig. 2.)

Type No. 81793, U. S. N. M.; length 60 mm.; Toro Point, Canal Zone.

Head 4.6; depth 5.5; D. about 84; A. about 64; scales about 135.

Body elongate, compressed, tapering posteriorly; head moderate, not much deeper than broad; snout rather blunt, 4.8 in head; eye very small, lateral, 6.7; interorbital broad, convex, 3-4; mouth rather large, horizontal; maxillary reaching far beyond eye, broad posteriorly, 2 in head; snout and lower jaw with short dermal flaps; lips with prominent folds, forming slight papillæ along edges of mouth; teeth all small, in bands on jaws, vomer and palatines; opercle and preopercle unarmed; gill-rakers poorly developed, 3 on lower limb of first arch; scales very small, present on head and body; lateral line present only on anterior half of body; dorsal fin long, continuous, its origin over base of pectorals; caudal fin pointed, confluent with the dorsal and anal; ventral fins very close together, each with 2 rays, inserted at isthmus, nearly on the humeral symphysis; pectoral fins normal, rounded, scales on base, 1.7 in head.

Color in life dark red; the vertical fins somewhat darker than the body. Color in spirits brown; the vertical fins very dark at base; ventrals and pectorals pale brown.

A specimen, 60 mm. in length, taken on a coral reef at Toro Point, Canal Zone, is the type and only specimen secured of the new genus and species here described.

Family LXXXVI. **Bregmacerotidæ.**

Body stout, with robust caudal portion; vent before middle of body; suborbital moderate; no barbels, spines nor cirri on head;

mouth terminal; teeth minute, present on jaws and vomer; no pseudobranchiæ; gill-openings wide, the membranes free from the isthmus; dorsal fins 2, the first consisting of an elongate, slender occipital ray; the second dorsal depressed medially, forming 2 lobes; caudal fin truncate or convex; anal fin similar to soft dorsal; dorsal and anal depressible in a groove of scales. A single genus of this family is known.

274. Genus **Bregmaceros** Thompson.

Bregmaceros (Cantor, MS.) Thompson, Mag. Nat. Hist., New Ser., IV, 1840, 184 (type *Bregmaceros mcclellandi* Thompson).

Calloptilum Richardson, in Hinds, Zoöl. Voy. Sulphur, Ichth., 1845, 94 (type *Calloptilum mirum* Richardson).

Asthenurus Tickell, Journ. Asiat. Soc. Bengal, XXXIV, 1865, 32 (type *Asthenurus atripinnis* Tickell).

The characters of this genus are included in the family description.

717. Bregmaceros mcclellandi Thompson.

Bregmaceros mcclellandi (Cantor, MS.) Thompson, Mag. Nat. Hist., New Ser., IV, 1840, 184 (mouth of the Ganges); Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 197.

Calloptilum mirum Richardson, in Hinds, Zoöl. Voy. Sulphur, Ichth., 1845, 95, Pl. XLVI, figs. 4-7.

Bregmaceros macclellandii Günther, Cat. Fish. Brit. Mus., IV, 1862, 368; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2526.

Asthenurus atripinnis Tickell, Journ. Asiat. Soc. Bengal, XXXIV, 1865, 32, with Pl. (Bay of Bengal).

Bregmaceros bathymaster Jordan & Bollman, Proc. U. S. Nat. Mus., 1889, 173 (Albatross Station 2804, Panama Bay, 47 fathoms).

Head 5.2; depth 6.6; D. about I, 18-X-15; A. about 18, X, 22; scales 58 to 64.

Body moderately elongate, compressed, the back not elevated; head short, small, moderately compressed; no serratures or spines; snout blunt, a little shorter than eye; eye 3 in head; interorbital ridged, about as broad as eye; mouth very oblique, the jaws subequal; maxillary reaching beyond middle of eye, 2.2 in head; teeth in both jaws close-set, moderate, recurved, apparently in a single series; gill-membranes separate, free from the isthmus; no barbels; scales rather large, caducous; vent slightly behind anterior third of total length; dorsal beginning with a single long slender spine on occiput, nearly

⅓ longer than head, then with rudimentary rays not rising above the sheath for a distance equal to the longest spine; the dorsal proper originating over vent, the anterior rays moderately elevated, these followed by shorter and more slender rays, becoming too small to count, the rays again becoming conspicuous just before the caudal and about ½ as high as the anterior rays; anal opposite dorsal and similar to it; caudal free from dorsal and anal; ventral fins jugular, with 4 rays, 3 of them long, reaching about middle of anal fin, the fourth ray short; pectorals inserted high, somewhat shorter than head.

Color brown above; sides and below silvery; back and base of anal closely dotted with dusky; dorsal mostly dusky; caudal pale, dusky at base, with a narrow white cross-bar; lower fins pale.

This widely distributed species was not seen by us. The above description is compiled from published accounts.

Recorded from various parts of the tropical Pacific. The Panama record is based on specimens dredged by the Albatross at Station 2804.

Family LXXXVII. **Pleuronectidæ.**

THE FLOUNDERS.

Body much compressed, deep, and elliptical in shape; head twisted, both eyes on one side in the adult; premaxillaries protractile; gill-arches 4 in number; pseudobranchiæ present; air bladder wanting; vent close to head; scales various, usually small; lateral line rarely absent, extending on caudal fin; dorsal fin composed of soft rays only, beginning on head and extending nearly to caudal; anal fin similar but shorter; caudal fin sometimes continuous with dorsal and anal; ventrals variously placed, one sometimes wanting; pectoral fins rarely absent, placed high. The flounders are oviparous, the eggs being small and numerous. Many of the species are of much economic value. Several species on the Pacific coast of Panama are frequently seen in the market, but the Atlantic species of that vicinity rarely reach a size great enough to make them of commercial value.

KEY TO THE GENERA.

a. Ventral fins symmetrical, or at least both lateral, neither situated on abdominal ridge; lateral line arched anteriorly.

b. Gill-rakers short and broad, with strong teeth; the ventral fin on eyed side produced. *Pseudorhombus,* p. 971.

bb. Gill-rakers rather long and slender; the ventral fin on eyed side not notably produced.

c. Origin of dorsal above pupil of upper eye. *Hippoglossina,* p. 973.

cc. Origin of dorsal in advance of upper eye. *Paralichthys,* p. 974.

aa. Ventral fins unsymmetrical, the one of eyed side inserted on abdominal ridge; lateral line either straight or arched.

d. Lateral line anteriorly with a prominent arch.

e. Interorbital very narrow, the ridges coalesced, and armed with a strong retrorse spine. *Engyophrys,* p. 975.

ee. Interorbital broad, concave, the ridges separate and not armed with a spine. *Platophrys,* p. 977.

dd. Lateral line straight or nearly so, never with a prominent arch anteriorly.

f. Mouth rather large, the maxillary equal to or greater than one-third the length of head.

g. Teeth in upper jaw biserial; gill-rakers short and rather thick; scales strongly ctenoid on eyed side, cycloid on blind side. *Syacium,* p. 980.

gg. Teeth in upper jaw uniserial.

h. Gill-rakers of moderate length, slender; scales thin, more or less deciduous, weakly ctenoid. *Citharichthys,* p. 985.

hh. Gill-rakers very short and thick; scales firm, not deciduous.

i. Scales ctenoid on eyed side, smooth on blind side. *Azevia,* p. 990.

ii. Scales cycloid on both sides. *Cyclopsetta,* p 991.

ff. Mouth very small, the maxillary less than one-third the length of head; teeth small, none on eyed side in upper jaw. *Etropus,* p. 992.

275. Genus **Pseudorhombus** Bleeker.

Pseudorhombus Bleeker, Versl. Ak. Amsterdam, XIII, 1862, 426 (type *Rhombus polyspilos* Bleeker).

Ancylopsetta Gill, Proc. Ac. Nat. Sci. Phila., 1864, 224 (type *Ancylopsetta quadrocellatus* Gill).

Ramularia Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2633 (type *Ancylopsetta dendritica* Gilbert).

Body with eyes and color on left side, deep, ovate, the depth greater than half the length; caudal peduncle short; mouth rather large; teeth in the jaws in one series, enlarged anteriorly; scales strongly ctenoid on both sides of the body; lateral line with a strong arch anteriorly; gill-rakers short and broad, with strong teeth; both ventral fins lateral, the left one produced.

718. Pseudorhombus dendritica (Gilbert).

Ancylopsetta dendritica Gilbert, Proc. U. S. Nat. Mus., 1890, 121 (Gulf of California); Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 199, Pl. XXXIII, fig. 62.

Ramularia dendritica Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2633.

Hippoglossina sabanensis Boulenger, Boll. Mus. Zoöl. Anat. Torino., XIV, No. 346, 1899, 4 (Rio Sabana, Panama).

Head 3.6 to 3.85; depth 1.75 to 1.9; D. 76 to 82; A. 59 to 64; scales 99 to 104.

Body very broad; the dorsal and ventral outlines about evenly curved, both strongly convex, a slight depression over upper eye; head rather short; snout blunt, with a blunt spine on colored side, 5.9 to 6.3 in head; eye 5.1 to 5.3; interorbital scaly, nearly equal to half the vertical diameter of eye; mouth rather large, very oblique; maxillary reaching posterior margin of pupil, 2.55 to 2.85 in head; teeth in single series, pointed, directed inward and becoming gradually larger toward front of jaws; gill-rakers short, as broad as long, with strong teeth, 6 on lower limb of first arch; scales small, strongly ctenoid on both sides, extending on all of the vertical fins; lateral line anteriorly with a strong arch, the curved portion about equal to length of head to preopercular margin; origin of dorsal over anterior margin of pupil, the outline of the fin evenly and gently convex to posterior rays, the rays then becoming rapidly shortened, forming a slight angle; caudal fin evenly rounded; anal fin similar to dorsal, its origin at vertical from opercular margin; ventral fins well developed, the one on colored side very long and narrow, varying greatly among specimens, equal to or notably longer than head in specimens at hand; pectoral fins moderate, the one on colored side slightly the longer, 1.4 to 1.55 in head.

Color grayish brown, with 3 large black spots, larger than eye, with yellow centers, usually surrounded by a distinct yellowish ring; the posterior spot located on the lateral line in advance of the caudal peduncle; the two anterior ones situated under the middle of the dorsal about midway between the dorsal and ventral outlines, respectively; distal portions of the vertical fins and the ventral fin on colored side darker than body.

This species is represented in the present collection by 9 specimens, ranging in length from 190 to 275 mm. It is occasionally seen in the Panama City market and it is of some commercial value.

Known from the Gulf of California to Panama Bay. Our specimens are from the Panama City market.

276. Genus **Hippoglossina** Steindachner.

Hippoglossina Steindachner, (Sitzb. k. Ak. Wiss. Wien, LXXIV) Ichth. Beitr., V, 1876, 13 (type *Hippoglossina macrops* Steindachner).

Eyes and color indifferently on the left or right side; mouth rather large, greater than a third of the length of head; teeth small, uniserial; interorbital narrow; gill-rakers rather long and slender; lateral line anteriorly with a strong arch; scales ctenoid; origin of dorsal above pupil; ventral fins both lateral; anal spine obsolete. A single species comes within the scope of the present work.

719. Hippoglossina bollmani Gilbert.

Hippoglossina macrops Jordan & Bollman, Proc. U. S. Nat. Mus., 1889, 175 (not of Steindachner).

Hippoglossina bollmani Gilbert, Proc. U. S. Nat. Mus., 1890, 122 (Albatross Station 2805, Panama Bay, 51½ fathoms); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2621; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 197.

Body regularly elongate, elliptical, the ventral and dorsal curves nearly equal; head 3.75 to 3.8 in length; snout 5 in head; eyes large, the lower slightly in advance of the upper, 3.66 to 4 in head; interorbital space a narrow, sharp, naked ridge; mouth rather large; the maxillary reaching about to middle of pupil, 2.33 to 2.6 in head; teeth equally developed on both sides, small and equal, uniserial; gill-rakers moderately long and slender, the longest 3 in length of ventral of eyed side, 8 or 9 developed on lower limb of first arch, the last 2 much shorter; scales small, firm, strongly ctenoid, those below pectoral much reduced, about 40 in a cross series; arch of lateral line strongly marked, 2.66 to 2.8 in straight part; dorsal beginning over middle of pupil of upper eye, its anterior rays low, its longest rays 2.57 in head; a strong antrorse spine before anal; pectoral of eyed side 2 in head, that of blind side 2.5 to 2.66 in head; caudal acute, its peduncle long; ventrals subequal, each 6 rayed, 4 in head, extending more than ½ their length beyond vent, each lateral, but that of eyed side nearest ridge of abdomen, and a little beyond its fellow; last ray of ventral joined to abdomen alongside of anal spine.

Color grayish brown; a row of 6 round, bluish spots, smaller than pupil, along base of dorsal; 4 similar spots along base of anal, and a few indistinct smaller ones on rest of body and head; body with 6 large black spots somewhat smaller than eye, these regularly 4 below dorsal and 2 above anal, the first one below dorsal above arch of lateral line, the second above anterior third of straight part, the third at base of last rays and almost forming a cross-bar with the first at base of anal rays; dorsal, anal, and caudal dusky, with small whitish spots; a pale spot at base of last 4 dorsal and anal rays; a small black spot at base of outer caudal rays on peduncle; pectorals and ventrals dusky, but not spotted; right side immaculate.

Known only from Panama Bay, where specimens were dredged by the Albatross at Station 2805, at a depth of 51½ fathoms. The species was not seen by us. The above description is compiled from published accounts.

277. Genus **Paralichthys** Girard.

Paralichthys Girard, (House of Repr. Ex. Doc. No. 91) Rept. Expl. & Surv. Miss. R. to Pac. O., X, Pt. IV, 1858, 146 (type *Pleuronectes maculosus* Girard).

Uropsetta Gill, Proc. Ac. Nat. Sci. Phila., 1862, 330 (type *Hippoglossus californicus* Ayres).

Chænopsetta Gill, Proc. Ac. Nat. Sci. Phila., 1864, 218 (type *Platessa ocellaris* DeKay).

Body oblong; eyes and color normally on left side; mouth large, oblique; jaws with a single row of sharp teeth; no teeth on vomer or palatines; gill-rakers rather long; lateral line simple, with a strong curve anteriorly; scales small, cycloid or ctenoid; dorsal fin beginning before eye, its anterior rays not produced; caudal fin double concave, or double truncate; no anal spine; both ventral fins lateral. A single species of this large genus is included in the Panama collection.

720. Paralichthys woolmani Jordan & Williams.

Paralichthys adspersus Jordan & Bollman, Proc. U. S. Nat. Mus., 1889, 182 (not of Steindachner).

Paralichthys woolmani Jordan & Williams, in Gilbert, Proc. U. S. Nat. Mus., 1897, 457 (Panama Bay); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2628.

Paralichthys sinaloæ Jordan & Abbott, in Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2872 (Mazatlan).

Paralichthys woolmanni Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 197 (Panama Bay).

Head 3.2 to 3.8; depth 2 to 2.3; D. 71 to 78; A. 54 to 58; scales 102 to 110.

Body rather elongate; anterior profile concave in front of eye; head moderate; snout rather short, 4.15 to 4.6 in head; eye 4.25 to 6.4; interorbital increasing in width with age, 14 to 38 in head; mouth large, oblique, the lower jaw slightly projecting; maxillary broad, reaching vertical from posterior margin of lower eye, 2 to 2.2 in head; teeth on jaws strong, pointed, largest anteriorly; preopercular margin free and distinct; gill-rakers strong, at least half as long as eye, 12 or 13 on lower limb of first arch; scales cycloid, small anteriorly, becoming larger posteriorly; origin of dorsal over anterior margin of upper eye; caudal fin forming an obtuse angle, the median rays longest; origin of anal under base of pectorals; ventral fins moderate, reaching beyond origin of anal; pectoral fins moderate, 1.85 to 2.1 in head.

Color in alcohol brownish, spotted with rather large, round, black spots extending on the fins; two more or less distinct rows of spots on dorsal and anal and 3 rows on caudal; in addition to the large black spots small dark specks present on the body and all the fins. The color markings are much more distinct on the small specimen than they are on the larger ones. The species undoubtedly has color protection highly developed, as the specimens when taken very closely resembled the bottom, both in shade and pattern, on which they were caught. An excellent opportunity for making observation relative to protective coloration was found at Taboga Island, where the species is common and inhabits the shallow shore water.

We have at hand 16 specimens, ranging in length from 47 to 305 mm. The species is rather common at Panama and it is of some commercial value.

Known from Lower California to Callao, Peru. Our specimens are from Chame Point, Taboga Island, and the Panama City market.

278. Genus **Engyophrys** Jordan & Bollman.

Engyophrys Jordan & Bollman, Proc. U. S. Nat. Mus., 1889, 176 (type *Engyophrys sancti-laurentii* Jordan & Bollman).

Body ovate, very strongly compressed; mouth rather small, notably less than one-third the length of head; teeth small, subequal, none on vomer; eyes and color on left side; interorbital space very narrow and armed with a strong retrorse spine; gill-rakers very small, obsolete; scales moderate and some of them weakly ctenoid on eyed side;

lateral line with a strong arch anteriorly; no anal spine; the left ventral on ridge of abdomen. A single species is known.

721. Engyophrys sancti-laurentii Jordan & Bollman.

Engyophrys sancti-laurentii Jordan & Bollman, Proc. U. S. Nat. Mus., 1889, 176 (Albatross Stations 2795 and 2805, Panama Bay, 33 to 51½ fathoms); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2668; Garman, Memoir. Mus. Comp. Zoöl., XXIV, 1899, 222 (Panama Bay); Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 199.

Head 3.45 to 3.8; depth 1.8 to 1.95; D. 85 to 88; A. 66 to 70; scales 65 to 70.

Body ovate, strongly compressed; dorsal and ventral outlines about evenly curved; head short; snout blunt, 6.2 to 7.1 in head; eye 3.65 to 4.1; interorbital very narrow, the ridges coalesced, but forking above pupil of lower eye, the lower ridge with a strong retrorse spine above anterior margin of lower eye; mouth small, strongly oblique; maxillary reaching anterior margin of eye, 4.1 to 4.3 in head; teeth in the jaws present only on blind side, small, close-set, directed inward; gill-rakers very short, about 5 or 6 on lower limb of first arch; scales rather small, thin, cycloid on blind side, some weakly ctenoid on eyed side; lateral line with a strong arch anteriorly, the arched portion slightly longer than snout and eye; origin of dorsal slightly in advance of anterior margin of upper eye, the fin convex, somewhat angulate, the last rays arising at base of caudal rays; caudal fin strongly rounded; anal fin similar to the dorsal, its origin under margin of opercle; ventral fins well developed, of about equal length, the left one on ventral ridge; pectoral fins equal, 1.7 to 1.8 in head.

"Color of left or eyed side blackish-brown, with scattered white and black spots, the latter most prominent along base of dorsal and anal fin. Three large black, non-ocellated blotches on straight part of lateral line, the first at beginning, second at middle, third on peduncle. Fins dusky; dorsal and anal with scattered white and black spots; caudal with five black spots arranged in a curved series. Blind side with five or six curved parallel dusky bands as wide as eye, the first beginning on interopercle and curving across cheek to along base of dorsal; second beginning at throat and curving along posterior margin of preopercle, and extending on back, parallel with the first from vent; third curving around in front of pectorals, across posterior part of opercle, and extending to base of dorsal fin behind the middle; rest behind pectorals. All of these bands fade out behind middle of body, so that the posterior portion is immaculate. In young examples these bands are very faint or obsolete." (Jordan & Bollman.)

This species was not taken by us. The above description (exclusive of color) is based on faded alcoholic specimens from the National Museum collection.

Recorded from Panama Bay only, where it was taken by the Albatross in 33 and 51.5 fathoms.

279. Genus **Platophrys** Swainson.

Platophrys Swainson, Nat. Hist. & Class. Fish., II, 1839, 302 (type *Pleuronectes ocellatus* Agassiz).

Peloria Cocco, Intor. Alcun. Pesci Messina, 1844, 21 (type *Peloria heckeli* Cocco).

Rhomboidichthys Bleeker, Act. Soc. Sci. Indo-Néerl., I, 1856, 67 (type *Rhomboidichthys myriaster* Bleeker).

Body ovate, strongly compressed; mouth of the large type but comparatively small, the maxillary one-third or less in head; teeth small, subequal, in 1 or 2 series; no teeth on vomer or palatines; eyes and color on the left side; interorbital space broad, concave, broadest in adult males; scales small, ctenoid; lateral line with a strong arch in front; origin of dorsal in advance of eye, none of its rays produced; caudal fin convex; ventral fin of the colored side on ridge of abdomen; pectoral fin of the left side usually produced in the adult, at least in the male; color usually variegated. This genus is represented by 2 species in the Panama collection. A third species, from rather deep water, although not seen by us, is included.

KEY TO THE SPECIES.

a. Dorsal and anal fins long, D. 88 to 96; A. 68 to 74; scales 85 to 92; mouth rather large, maxillary 2.6 to 3.3 in head; eye with a dermal tentacle above. *maculiferus*, p. 977.

aa. Dorsal and anal fins slightly shorter, D. 89; A. 65; scales 75; mouth rather large, maxillary 3 in head. *constellatus*. p, 978.

aaa. Dorsal and anal fins rather short, D. 78 to 82; A. 56 to 63; scales 65 to 74; mouth rather small, maxillary 3.3 to 3.6 in head; eye without a dermal tentacle. *ocellatus*, p. 979.

722. Platophrys maculiferus (Poey).

Pleuronectes maculiferus Poey, Memorias, II, 1861, 316 (Cienfuegos).

Rhomboidichthys maculiferus Poey, Syn. Pisc. Cub., 1868, 408.

Platophrys maculifer Jordan & Goss, Rept. U. S. Fish Comm., XIV, 1886 (1889), 267; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2664.

Head 3.33 to 3.8; depth 1.7 to 1.85; D. 88 to 96; A. 68 to 74; scales 85 to 92.

Body deep, ovate; the dorsal profile anteriorly nearly evenly convex, with only a trace of an indentation above and in front of lower eye; head short, deep; snout very short, 3.6 to 4.2 in head; eye with a dermal tentacle above, 3.8 to 4.5; interorbital broad, deeply concave, 4.35 to 6.75 in head; mouth moderate, oblique; maxillary reaching nearly opposite middle of lower eye in adult, not quite as far back in young, 2.6 to 3.3 in head; teeth in jaws rather small, pointed, in a single series; gill-rakers short, rather blunt, 7 or 8 on the lower limb of first arch; scales rather small, ctenoid on the colored side, cycloid on the blind side; lateral line with a prominent arch anteriorly, the length of arch nearly ⅕ of the straight portion; origin of the dorsal in advance of lower eye, none of the rays produced; caudal fin rounded, well separated from the dorsal and anal; anal fin similar to the dorsal; ventral fins well developed, the one of the colored side on ridge of abdomen; pectoral fins moderate in the young, 1.3 to 1.5 in the head, greatly produced in the adult male, reaching nearly to caudal peduncle.

Color of preserved specimens brownish, with darker blotches and with round pale spots (blue in life); 3 large black blotches on the lateral line, one large one at the beginning of the straight portion, a smaller but better defined spot on middle of lateral line and a small vague one further back; fins somewhat paler in color than the body, with indefinite dark spots and specks; the vertical fins with a few pale spots.

This species is represented in the present collection by 9 specimens, ranging in length from 50 to 175 mm. It apparently is a rather rare species.

This fish appears previously to have been recorded only from Cuba. Our specimens are from Colon and Porto Bello.

723. Platophrys constellatus Jordan.

Platophrys constellatus Jordan, in Jordan & Goss, Rept. U. S. Fish Comm., XIV, 1886 (1889), 266 (James Island, Galapagos Archipelago); Jordan & Bollman, Proc. U. S. Nat. Mus., 1889, 183 (Panama Bay); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2663; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 199.

"Head 4; depth 1½; eye 3⅓ in head; interorbital width 3. D. 89;

A. 65; scales 75. Body elliptic-ovate, the outlines more regular than in *P. lunatus;* anterior profile of head convex before the interorbital area, the very short snout scarcely forming a reentrant angle at its base; anal rays without spinules at their base; mouth small, the maxillary 3 in head; no spines about the snout; pectoral short; curve of lateral line 6 times in straight part. Color dark brown, with numerous stellate white spots, the most distinct of them with darker edgings; these generally scattered over the body, but some of them on sides of body are gathered together in little rings (perhaps these spots are blue rather than white in life); fins mottled with dark brown, the pectoral finely barred."

The above description is copied from Jordan & Evermann (1898). It is based on specimens the largest of which was about 90 mm. long. The species was not seen by us.

Known from the Galapagos Archipelago and from specimens from Panama Bay dredged by the Albatross at Stations 2795, 2796, 2797, at a depth of 33 fathoms.

724. Platophrys ocellatus (Agassiz).

Rhombus ocellatus Agassiz, in Spix, Pisc. Brasil., 1831, 85, Pl. XLVI (Brazil).

Platophrys ocellatus Swainson, Nat. Hist. & Class. Fish., II, 1839, 302; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2663, Pl. CCCLXXXII, fig. 939.

Rhombus bahianus Castelnau, Anim. Nouv. Rares Amér. Sud, 1855, 78, Pl. XLI, fig. 1 (Bahia).

Rhomboidichthys ocellatus Günther, Cat. Fish. Brit. Mus., IV, 1862, 433.

Platophrys nebularis Jordan & Gilbert, Proc. U. S. Nat. Mus., 1884, 31 & 143 (Key West).

Head 3.9 to 4; depth 1.7; D. 78 to 82; A. 56 to 63; scales 65 to 74.

Body ovate, the anterior profile steep, noticeably concave over and in front of lower eye; head short; snout slightly projecting, 4 to 4.8 in head; eye without a dermal tentacle, 3 in head; interorbital space deeply concave, 4.8 to 7.5 in head; mouth small, very oblique, the lower lip entering into the profile of the head; maxillary reaching vertical from anterior margin of lower eye, 3.3 to 3.6 in head; teeth in the jaws pointed, in a single series; gill-rakers very short, blunt, about 7 rudiments on lower limb of first arch; scales rather small, ctenoid on the colored side, cycloid on the blind side; lateral line with a steep arch anteriorly, the arch about ¼ the length of the straight part; origin of the dorsal fin over anterior nostril, none of the rays produced; caudal fin strongly convex; anal fin similar to the dorsal; ventral fin moderate, the one on the colored side on the ridge of the abdomen separated from the anal only by a narrow interspace; pectoral fins of the opposite sides about equally developed, about 1.2 in head.

Color in alcohol brownish, with many paler areas surrounded by dark rings; an indefinite dark spot at the beginning of the straight part of the lateral line, another and a somewhat larger one on the middle of the straight part of the lateral line and a third and smaller one on the lateral line under the posterior rays of the dorsal fin; the fins paler than the body, with many small dark specks.

The above description is based on 3 small specimens, respectively 53, 58, and 60 mm. in length. We refer these specimens somewhat doubtfully to this species, with which they appear to agree fairly well, except in dentition. *P. ocellatus* is described as having two series of teeth in the upper jaw, while our specimens appear to have only a single series. This small species is of no commercial value, as it reaches a length of only about 75 mm.

Known from Long Island, New York, to Rio de Janeiro, Brazil. Our specimens are from Porto Bello.

280. Genus **Syacium** Ranzani.

Syacium Ranzani, Novi Comment. Ac. Sci. Inst. Bonon., V, 1842, 20 (type *Syacium micrurum* Ranzani).

Hemirhombus Bleeker, Versl. Ak. Amsterdam, XIII, 1862, 425 (type *Hemirhombus guineensis* Bleeker).

Aramaca Jordan & Goss, in Jordan, Rept. U. S. Fish Comm., XIII, 1885 (1887), 921 (type *Hemirhombus pœtulus* Jordan & Gilbert).

Body elliptical, much compressed; interorbital space variable, the orbital ridges not coalesced, often broader in the male than in the female; mouth moderate, the gape curved; teeth in the upper jaw biserial, in the lower jaw uniserial, the front teeth somewhat enlarged; vomer toothless; gill-rakers short and rather thick; scales strongly ctenoid on colored side, cycloid on blind side; lateral line without an arch; pectoral fins both present, the one on colored side sometimes filamentous; ventral fins short, the left one on ventral ridge; no anal spine.

KEY TO THE SPECIES.

a. Interorbital space narrower than pupil.

b. Scales rather small, 60 to 68; gill-rakers 7 on lower limb of first arch; body with ring-like ocelli. *micrurum*, p. 981.

bb. Scales larger, 57; gill-rakers 8 on lower limb of first arch; body usually without ring-like ocelli. *ovale*, p. 982.

aa. Interorbital broad, equal to or broader than eye; scales rather large, 50 to 57.

c. Interorbital space broader than longest diameter of eye in male, but about equal to vertical diameter of eye in female; D. 82; pectoral fin of colored side barred. *papillosum*, p. 983.

cc. Interorbital space very broad, much broader than eye; D. 89; pectoral fin of colored side not barred. *latifrons*, p. 984.

725. Syacium micrurum Ranzani.

Syacium micrurum Ranzani, Novi Comment. Ac. Sci. Inst. Bonon., V, 1842, 20, Pl. 5 (Brazil); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2672.

Hippoglossus ocellatus Poey, Memorias, II, 1861, 314 (Cuba).

Hemirhombus aramaca Günther, Cat. Fish. Brit. Mus., IV, 1862, 422 (Cuba; Jamaica).

Citharichthys æthalion Jordan, Proc. U. S. Nat. Mus., 1886, 52 (Havana).

Head 3.6 to 4; depth 2.25 to 2.45; D. 86 to 91; A. 65 to 69; scales 60 to 68.

Body elliptical, the dorsal and ventral outlines about equally arched; anterior profile with an abrupt indentation in advance of upper orbit, thence rather gently convex; head rather small; snout short, 4.3 to 4.75 in head; eye 3.45 to 4.4; interorbital space narrow, the ridges not coalesced, narrower than pupil even in our largest specimen (148 mm.); mouth moderate, oblique, the lower jaw included; maxillary reaching to or slightly past middle of lower eye, 2.55 to 2.7 in head; teeth in upper jaw biserial, the outer series anteriorly somewhat enlarged; pseudobranchiæ moderate; gill-rakers shorter than pupil, 7 on lower limb of first arch; scales in rather regular series, ctenoid on colored side, cycloid on opposite side; lateral line nearly straight, without an arch; dorsal and anal fins about evenly elevated, coterminal, origin of dorsal a little in advance of upper eye; caudal fin slightly double concave, the median rays the longest; ventral fins moderate, the left one on ventral ridge; pectoral fin of colored side rather long, the upper ray slightly filamentous in our largest specimen, 1.35 to 1.6 in head, the fin of blind side from ⅔ to ¾ the length of its fellow.

Color brownish, with many irregular dark blotches and some round black spots, surrounded by a grayish ring and then a black ring; a large black blotch on lateral line under end of pectoral, another smaller one on base of caudal peduncle; fins with many small dark spots and specks; the pectoral fin of colored side usually barred with black.

This species is represented by 33 specimens, ranging in length from 90 to 175 mm.

Known from Key West, Florida, to Rio de Janeiro and Natal, Brazil. Our specimens are from Colon and Porto Bello.

726. **Syacium ovale** (Günther).

Hemirhombus ovalis Günther, Proc. Zoöl. Soc. London, 1864, 154 (Panama).

Citharichthys ovalis Jordan, Proc. U. S. Nat. Mus., 1885, 391.

Syacium ovale Jordan & Goss, Rept. U. S. Fish Comm., XIV, 1886 (1889), 271; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2674; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 199 (Panama).

Head 3.7 to 4.1; depth 2.1 to 2.4; D. 80 to 88; A. 63 to 66; scales 54 to 57.

Body elliptical, the dorsal and ventral outlines about evenly arched; the anterior profile with a sharp depression in front of upper orbit, thence rather gently convex; head rather small; snout short, 4.7 to 5.7 in head; eye 4.3 to 4.85; interorbital very narrow, the ridges not quite coalesced, very narrow in young, about as broad as pupil in adult (specimen 185 mm. long); mouth rather large, oblique, the lower jaw included; maxillary rather narrow, scaled, reaching a little beyond middle of lower eye, 2.4 to 2.6 in head; teeth in upper jaw biserial, the outer ones anteriorly somewhat enlarged; the lower third of vertical margin of preopercle free, the rest adnate and scaled over; pseudobranchiæ large; gill-rakers shorter than pupil, 7 or 8 on lower limb of first arch; scales moderate, in rather regular series, ctenoid on colored side, cycloid on blind side; lateral line without arch; dorsal and anal about equal in height, coterminal, leaving a short caudal peduncle; origin of dorsal a little in advance of upper orbit; caudal fin slightly double concave, the median rays longest;

ventral fins moderate, the left one on ventral ridge; pectoral fin of colored side moderate, none of the rays filamentous, 1.4 to 1.6 in head; pectoral of blind side ⅔ to ¾ the length of its fellow.

Color brownish, with indefinite dark spots and blotches; the smaller individuals with a dark area on lateral line under end of pectoral fin and a smaller dark blotch on lateral line opposite last rays of dorsal and anal; the fins with small dark spots. Our largest specimen is uniformly brown, with dark spots present only on the vertical fins.

We have at hand 7 specimens of this species, ranging in length from 110 to 185 mm. None of the specimens show any tendency to an increased width of the interorbital with age, beyond such variation as is usual and normal in fishes. Neither do our specimens have any of the rays of the pectoral fins perceptibly produced, hence there is no indication that this form intergrades with the closely allied *S. latifrons*.

Known from Mazatlan and Panama. Five specimens were seined at Naos Island and one was purchased in the Panama City market. The species apparently is not abundant.

727. **Syacium papillosum** (Linnæus).

Pleuronectes papillosus Linnæus, Syst. Nat., Ed. X, 1758, 271 (Brazil).

Pleuronectes aramaca Donndorf, Beitr. zur Ausgabe des Linn. Natursyst., III, 1798, 386.

Rhombus aramaca Cuvier, Règne Animal, Ed. II, II, 1829, 341.

Rhombus soleæformis Agassiz, in Spix, Pisc. Brasil., 1831, 86, Pl. XLVII (Atlantic Ocean).

Hippoglossus intermedius Ranzani, Novi Comment. Ac. Sci. Inst. Bonon., IV, 1840, 14, Pl. IV (Brazil).

Hemirhombus soleæformis Günther, Cat. Fish. Brit. Mus., IV, 1862, 423.

Hemirhombus pætulus Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 304 (Pensacola).

Citharichthys aramaca Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1882 (1883), 816.

Citharichthys pætulus Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1882 (1883), 964.

Aramaca papillosa Jordan, Proc. U. S. Nat. Mus., 1886, 602.

Aramaca soleæformis Jordan, Proc. U. S. Nat. Mus., 1886, 602.

Syacium papillosum Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2671, Pl. CCCLXXXIII, fig. 941.

Head 2.66; depth 2.33; D. 82; A. 63 to 70; scales 50 to 57.

This species does not occur in the Panama collection. It appears to differ from *S. micrurum* in having a much broader interorbital space which is greater than the long diameter of the eye in the male but about equal to the vertical diameter of the eye in the female; the scales are probably slightly larger and the ring-like spots or ocelli are wanting. The blind side is said to be wholly or partly dusky, especially in northern specimens.

Known from Charleston, S. C., to Rio de Janeiro, Brazil.

728. **Syacium latifrons** (Jordan & Gilbert).

Citharichthys latifrons Jordan & Gilbert, Bull. U. S. Fish Comm., I, 1881 (1882), 334 (Panama).

Syacium latifrons Jordan & Goss, Rept. U. S. Fish Comm., XIV, 1886 (1889), 271 ;Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2673; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 199.

Head 3.9; depth 2.15; D. 89; A. 66; scales 57.

Body elliptical, the dorsal and ventral outlines about evenly arched; anterior profile concave in front of upper eye, strongly convex above eye; head rather short and deep; snout short, 4.7 in head; eye rather large, 4.7 in head; interorbital broader than the longest diameter of eye, concave, 4.27 in head; mouth moderate, very oblique, the lower jaw included; maxillary rather narrow, scaled, reaching middle of lower orbit, 2.7 in head; teeth in the upper jaw biserial, the anterior teeth of the outer series somewhat enlarged; the lower third of vertical limb of preopercular margin free, the rest adnate and scaled over; pseudobranchiæ large; gill-rakers about half as long as pupil, 8 on lower limb of first arch; scales moderate, rather irregularly placed, strongly ctenoid on colored side, cycloid on blind side; lateral line without arch; dorsal and anal fins of about equal height, coterminal; origin of dorsal at vertical from anterior margin of lower orbit; caudal fin slightly double concave, the median rays longest; ventral fins moderate, the left one on the ventral ridge; pectoral on colored side well developed, the upper two rays filamentous, the upper one nearly half the length of body without caudal fin, the fin, without filaments, 1.35 in head; pectoral on the blind side without filaments, a little less than half the length of head.

Color in spirits brownish, with darker blotches, blind side wholly pale; dorsal, caudal and anal with dark spots; pectoral fin of colored side with 3 dark bars. The color is described by Jordan & Gilbert in the original description, as follows: "Head and body light brown, with grayish and light bluish dots, some darker areas and a few round brown spots ocellated with lighter. Interorbital space with a vertical brown bar bordered by lighter. Fins similarly marked, the dorsal and anal with a dark blotch on each eighth or tenth ray, the pectoral sometimes with one or more brownish bars."

The present collection contains a single specimen, 220 mm. long, which we refer to this species. Many of the color markings mentioned in the description of the "types" are not visible in our large preserved specimen. The species differs from *S. ovale* principally in the very broad interorbital and the long filamentous pectoral rays.

Previously known only from the "types" from Panama. Our specimen was purchased in the Panama City market. It apparently is a rare species.

281. Genus **Citharichthys** Bleeker.

Citharichthys Bleeker, Versl. Ak. Amsterdam, XIII, 1862, 427 (type *Citharichthys cayennensis* Bleeker).

Body oblong; color and eyes on the left side; mouth large, the maxillary reaching well beyond anterior margin of eye; teeth in the jaws small, sharp, none on vomer and palatines; gill-rakers moderate, slender; scales thin, slightly deciduous, weakly ctenoid; lateral line nearly straight; origin of dorsal in advance of eyes; ventral of colored side on ridge of abdomen; no anal spine; none of the fins produced; vertebræ 30 to 40. This genus is represented by 4 species* in the Panama fauna. They are all small flounders and of little commercial importance.

KEY TO THE SPECIES.

a. Eye large, about 3.75 in head, interorbital space broad, nearly equal to half the diameter of the large eye; gill-rakers very short and slender, less than diameter of pupil, 9 on lower limb of first arch. *platophrys*, p. 986.

aa. Eye small, about 4.5 to 9 in head; interorbital space narrow, never much broader than pupil; gill-rakers longer, as long as or longer than pupil, 11 to 14 on lower limb of first arch.

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*Since these pages were prepared, a fifth species, *C. arenaceus* Evermann & Marsh, has been recorded from Colon by Fowler (Proc. Ac. Nat. Sci. Phila., 1916, p. 405, and 1917, p. 136).

b. Dorsal and anal fins long, the dorsal with 78 to 86 rays, the anal with 58 to 65 rays; eye small, about 7 to 9 in head in specimens 160 mm. in length.

c. Scales rather large, 44 to 46 in lateral series; gill-rakers rather numerous, 13 or 14 on lower limb of first arch. *gilberti,* p. 987.

cc. Scales slightly smaller, 47 to 51 in lateral series; gill-rakers fewer, 11 or 12 on lower limb of first arch. *spilopterus,* p. 988.

bb. Dorsal and anal fins shorter, the dorsal with 74 rays, the anal with 54; eye larger, about 5.5 in head in specimens 160 mm. long; gill-rakers longest near the angle on lower limb of first arch, 13 in number; scales 48. *evermanni* sp. nov., p. 989.

729. Citharichthys platophrys Gilbert.

Citharichthys platophrys Gilbert, Proc. U. S. Nat. Mus., 1890, 454 (Albatross Station 2799, Panama Bay, 29½ fathoms); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2683; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 200.

"Head 3; depth 2. D. 78; A. 62; scales 43. Body ovate; caudal fin subsessile, the free portion of caudal peduncle about ½ as long as diameter of pupil, its depth ⅓ length of head. Mouth very oblique; maxillary 2½ in head, reaching vertical from middle of lower eye. Teeth slender, close set, in a single series in each jaw, those in front of upper jaw largest, but not canine-like. Eyes large, the lower much in advance of the upper, their horizontal diameter 3¾ in head. Interorbital space very wide for the genus, concave, divided by an oblique ridge running backward from middle of upper orbit; interorbital width 8¾ in head, nearly ½ as wide as eye. Distance from tip of snout to front of lower eye ⅔ diameter of eye, from tip of snout to upper eye ⅓ head. Gillrakers short and very slender, less than diameter of pupil, 9 present on horizontal limb of outer arch. Scales large, those on blind side weakly ctenoid. Dorsal beginning behind nostril on blind side of snout, its longest ray 2⅕ in head; pectoral of eyed side long and narrow, 4 in length, containing 11 rays, that of blind side but ½ its length; ventrals short; caudal rounded, 1⅗ in head. Color in spirits, uniform light brownish (olivaceous in life), without distinctive marks; fins somewhat dusky; ventral of eyed side jet black, that of blind side blackish on distal portion of inner rays."

This species was not seen by us. The above description is copied from Jordan & Evermann.

Known from a single specimen taken in Panama Bay at Albatross Station 2799, in 29½ fathoms.

730. Citharichthys gilberti Jenkins & Evermann.

Citharichthys spilopterus Günther, Trans. Zoöl. Soc. London, VI, 1869, 471, Pl. LXXX, fig. 2 (not of Günther, 1862); Jordan & Gilbert, Bull. U. S. Fish Comm., II, 1882 (1883), 108 & 111 (not of Günther).

Citharichthys gilberti Jenkins & Evermann, Proc. U. S. Nat. Mus., 1888, 157 (Guaymas, Mexico); Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 200 (Panama Bay).

Citharichthys sumichrasti Jordan & Goss, Rept. U. S. Fish Comm., XIV, 1886 (1889), 276 (Rio Zanatenco, Chiapas).

Head 3.6 to 3.85; depth 1.95 to 2.2; D. 81 to 86; A. 61 to 65; scales 44 to 46.

Body elongate, the dorsal profile not especially strongly convex; head moderate; snout not much longer than eye, 4.2 to 4.8 in head; eye moderate, 4.4 to 5.8; interorbital narrow, the orbital ridges coalesced, the space about equal to pupil; mouth very oblique; maxillary nearly or quite reaching vertical from posterior margin of eye, 2.25 to 2.7 in head; teeth in the jaws in a single series, the anterior ones somewhat enlarged; gill-rakers rather long and slender, the longest ones on middle of lower limb, 13 or 14 below angle on the first arch; scales rather large, thin, not very firm, finely ctenoid; lateral line slightly decurved; origin of dorsal over anterior nostril, the outline of fin without a definite angle; caudal fin strongly and evenly convex; origin of anal under base of pectorals, similar to the dorsal; ventral fins well developed, the left one on edge of abdomen; pectoral fins nearly symmetrical, the one on the colored side apparently slightly the larger, 1.95 to 2.3 in head.

Color in alcohol brownish, with indefinite dark blotches; the fins lighter brown than the body, with indefinite dark markings.

This species is represented by about 55 specimens, ranging in length from 70 to 260 mm. It is rather common, often occurring on very muddy bottom, and ascending streams to brackish water. It is of little commercial importance, because of the small size attained.

We also have 2 larval specimens, respectively 25 to 40 mm. in length, which we doubtfully refer to this species. These young still have the eyes on opposite sides, although the cranium has started to twist, placing the right eye somewhat higher than the left. The lateral line on the larger specimen is partly developed, showing that it is not of the arched type; scales are undeveloped; gill-rakers are present, and not much shorter than the eye; the anterior rays of the dorsal fin are filamentous, reaching nearly to base of caudal in the larger specimen, somewhat shorter in the smaller one; the left ventral is situated on the ventral ridge and is fully half the length of body, the right ventral is not much longer than the snout; the pectoral fins are short and equally developed. The left side has some dusky spots which form 5 indefinite cross-bars; there are dusky rings on the dorsal and anal fins. These color markings are all more distinct on the larger specimen.

This form may be distinguished from *C. spilopterus* by the larger scales, somewhat longer and more numerous gill-rakers and by the slightly larger eye. The last character is most noticeable when specimens of like size are compared.

Known from the Gulf of Lower California to Peru. Our specimens are from Chame Point, Balboa, Corozal, Panama and Juan Diaz.

731. Citharichthys spilopterus Günther.

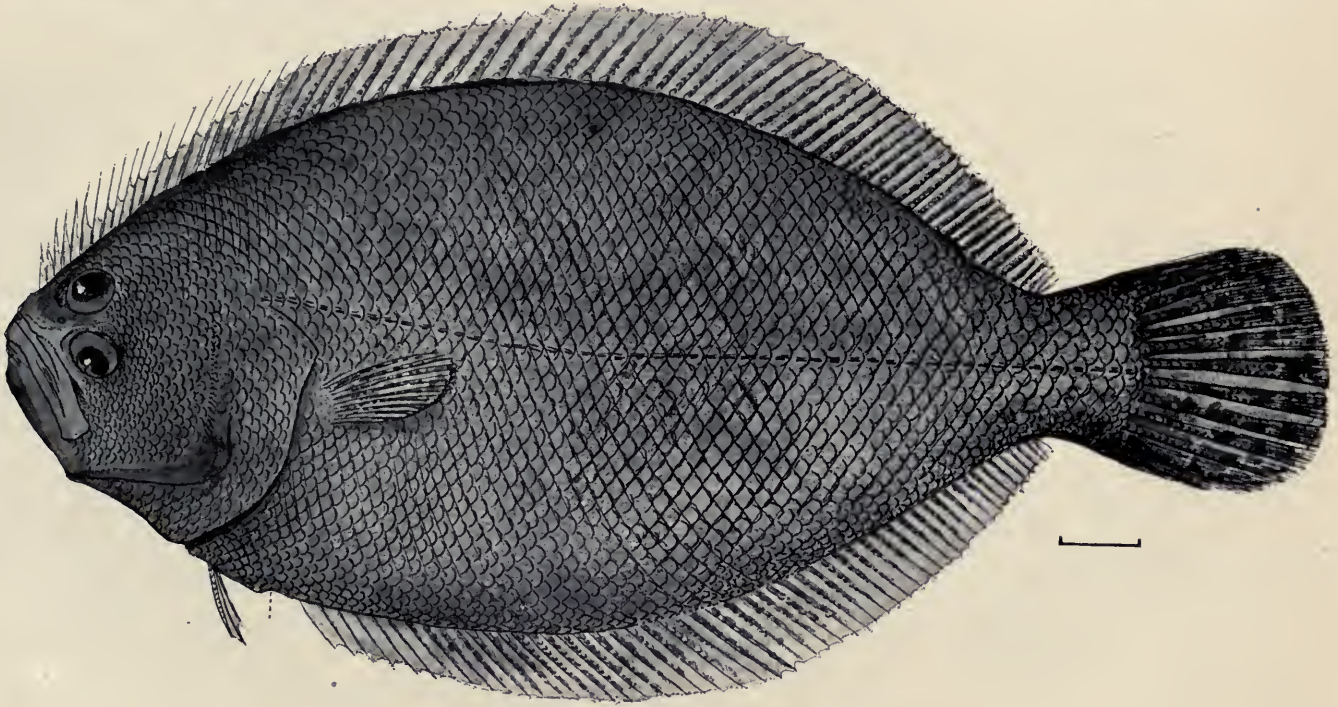
Citharichthys spilopterus Günther, Cat. Fish. Brit. Mus., IV, 1862, 421 (New Orleans; St. Domingo; Jamaica); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2685.

Citharichthys guatemalensis Bleeker, Versl. Ak. Amsterdam, XV, 1863, 452 (Guatemala).

Hemirhombus fuscus Poey, Syn. Pisc. Cub., 1868, 406 (Havana).

Head 3.05 to 4.1; depth 2.05 to 3; D. 78 to 84; A. 58 to 63; scales 47 to 51.

Body moderately elongate, the dorsal profile anteriorly scarcely more convex than the ventral; head comparatively small; snout not much longer than eye, 4.45 to 6.5 in head; eye 5 to 9.4; interorbital narrow, the orbital ridges coalesced, the space scarcely as broad as pupil; mouth large, very oblique, the jaws curved; maxillary reaching vertical from posterior margin of lower eye, 2.4 to 3.05 in head; teeth in the jaws in a single series, the anterior ones enlarged; gill-rakers short and rather slender, the longest ones on middle of lower limb of arch, none of them longer than pupil, 11 or 12 on lower limb of first arch; scales moderate, thin, not very firm, finely ctenoid (not cycloid as stated in current descriptions); lateral line without arch, slightly decurved; origin of dorsal over anterior nostril, the fin without angle; caudal fin evenly rounded; origin of the anal fin under base of pectorals, similar to the dorsal; ventral fins well developed, the left one on the ridge of the abdomen; pectoral fins nearly symmetrical, the one on the colored side apparently usually slightly the longer, 1.7 to 2.15 in head.



CITHARICHTHYS EVERMANNI sp. nov.
Drawn from the type 162 mm. in length.

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Color in alcohol brownish, with indefinite dark spots of various sizes and variously distributed; the fins light brown, with small dark specks and spots.

This species is very common on the Atlantic coast of Panama and it is usually found on muddy bottom. It ascends streams to brackish water. Numerous specimens, ranging in length from 27 to 170 mm., were preserved. It does not reach a large enough size to be of much commercial importance.

Known from the warmer parts of the American shore and neighboring islands from New Jersey to Brazil. Our specimens are from Toro Point, Mindi, Colon and Porto Bello.

732. **Citharichthys evermanni** sp. nov. (Plate C.)

Type No. 81045, U. S. N. M.; length 162 mm.; Porto Bello, Panama.

Head 3.65; depth 1.9; D. 74; A. 54; scales 48.

Body less elongate than in related species, the dorsal profile strongly convex at nape, much more strongly convex than the ventral outline; head rather short; snout not much longer than eye, 4.5 in head; eye rather large, 5.7; interorbital ridges coalesced, the space broader than pupil; mouth large, very oblique; maxillary reaching vertical from posterior margin of pupil, 2.25 in head; teeth in the jaws in a single series, the anterior ones somewhat enlarged; gill-rakers rather slender, those at angle of arch quite as long as those on median portion of lower limb, 13 below angle; scales thin, not very firm, weakly ctenoid; lateral line very slightly decurved; origin of dorsal over anterior nostril, the outline of fin convex, without angles; caudal fin evenly rounded; origin of anal fin slightly behind vertical from base of pectorals, similar to the dorsal; ventral fins well developed, the left one on edge of abdomen; pectoral fins moderate and about of equal size, 2 in head.

Color in alcohol uniform dark brown, nearly black; the fins somewhat lighter brown, with indistinct pale specks.

A single specimen, 162 mm. in length, was taken, which apparently is the type of a new species. It is close to *C. spilopterus,* but there are several small differences noticeable, viz., the dorsal profile anteriorly is much more strongly convex, making the body deeper at the nape; the dorsal and anal fins are shorter; the eye larger; the maxillary longer; the interorbital broader; the gill-rakers are apparently slightly more numerous and longer near the angle of the arch; and the color in alcohol is more uniform and much darker.

Our specimen, the type, was taken at Porto Bello.

282. Genus **Azevia** Jordan.

Azevia Jordan, in Jordan & Goss, Rept. U. S. Fish Comm., XIV, 1886 (1889), 271 (type *Citharichthys panamensis* Steindachner).

Body elliptical, compressed; interorbital very narrow, the ridges coalesced; mouth large, oblique; teeth on both jaws, uniserial, none on vomer or palatines; gill-rakers very short and thick, tubercle-like; lateral line without arch; scales firm, ctenoid on colored side, smooth on blind side; none of the fins especially modified or with elongate rays; ventrals free from the anal, the left one on ventral ridge; color normally on the left side. A single species of this genus is known.

733. Azevia panamensis (Steindachner).

Citharichthys panamensis Steindachner, (Sitzb. k. Ak. Wiss. Wien, LXXII) Ichth. Beitr., III, 1875, 62 (Panama); Jordan & Gilbert, Bull. U. S. Fish Comm., II, 1882 (1883), 108 & 111 (Panama).

Azevia panamensis Jordan & Goss, Rept. U. S. Fish Comm., XIV, 1886 (1889), 272 (Panama); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2677, Pl. CCCLXXXIV, fig. 942 (Mazatlan); Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 200 (Panama).

Head 3.7 to 4; depth 2.25 to 2.35; D. 90 to 99; A. 68 to 78; scales 76 to 91.

Body quite elongate, elliptical; anterior profile evenly convex; head rather short and deep; snout short, 4 to 4.35 in head; eye 4.6 to 4.9; interorbital very narrow, the ridges coalesced, 25 to 34 in head; mouth large, oblique; the upper jaw slightly projecting; maxillary reaching posterior margin of lower eye, 2 to 2.1 in head; teeth on anterior part of jaw rather strong, pointed; gill-rakers very short, not longer than broad, tubercular, surmounted with denticles, 8 to 10 on lower limb of first arch; scales moderate, the median portion of each scale on colored side strongly ctenoid, the scales on the blind side perfectly smooth; origin of dorsal slightly in advance of anterior nostril, none of the rays very high; caudal fin ending in an obtuse angle, the outer rays not notably longer than some of the intermediate ones; origin of anal at vertical from base of pectoral; ventral fins rather small, reaching beyond origin of anal, the left one on median line of ventral ridge; pectoral fin on colored side rather long and pointed, 1.65 to 1.85 in head, its fellow much shorter and bluntly rounded.

Color of preserved specimens brownish, with indefinite darker blotches, most distinct on the fins.

The species is not uncommon and is occasionally seen in the Panama City market. We preserved 8 specimens, ranging in length from 225 to 295 mm.

Known from Lower California to Panama. Our specimens were purchased in the Panama City market.

283. Genus **Cyclopsetta** Gill.

Cyclopsetta Gill, Proc. U. S. Nat. Mus., 1888, 601 (type *Hemirhombus fimbriatus* Goode & Bean).

This genus appears to differ from *Azevia* only in having smooth scales on the colored side as well as on the blind side.

734. Cyclopsetta querna (Jordan & Bollman).

Azevia querna Jordan & Bollman, Proc. U. S. Nat. Mus., 1889, 174 (Albatross Stations 2800 and 2802, Panama Bay, 7 to 16 fathoms).

Cyclopsetta querna Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2675; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 200.

Head 3.55 to 3.75; depth 1.75 to 2.35; D. 87 to 93; A. 69 to 73; scales 92 to 101.

Body elongate, elliptical; anterior profile nearly straight over the eyes, rather strongly convex at nape; head rather short and deep; snout short, 4.5 to 5.2 in head; eye 5 to 7.1; interorbital wider than pupil in adult (230 mm. and upward in length), the ridges coalesced, 12 to 18 in head; mouth large, the lower jaw included; maxillary reaching well beyond eye, 1.8 to 1.9 in head; teeth in jaws uniserial, a few of the anterior ones in upper jaw enlarged, those in sides of jaws rather small, about equally developed on both sides, the teeth in the lower jaw fewer but stronger than those in the upper; gill-rakers short and blunt, provided with sharp denticles, 8 or 9 on the lower limb of first arch; scales rather small, cycloid on both sides; origin of dorsal in front of eye, over anterior nostril, none of the rays produced; caudal fin very slightly double truncate, the median rays longest; origin of anal slightly behind vertical from base of pectorals coterminal with the dorsal, leaving a short caudal peduncle; ventral fins moderate, about equally developed, the left one on ventral ridge; pectoral fins moderate, the left one a little the larger, 1.7 to 2 in head.

Color in alcohol uniform brownish; fins of about the same color as the body.

This species is frequently seen in the Panama City market and it is of some value as food. We preserved 11 specimens, ranging in length from 205 to 310 mm. One of our specimens has no pectoral fin on the blind side, not even a rudiment being visible, but, in as much as we are unable to detect any other differences, we regard it as an abnormal specimen.

Known only from the coast of Panama. Our specimens are from the Panama City market.

284. Genus **Etropus** Jordan & Gilbert.

Etropus Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881, 364 (type *Etropus crossotus* Jordan & Gilbert).

Body oval; eyes and color on left side; head small; eyes small, separated by a narrow ridge; mouth very small; teeth small, none on colored side in upper jaws; vomerine teeth wanting; scales thin, ctenoid on left side, smooth on right side; lateral line simple, nearly straight; origin of dorsal over upper orbit; anal without spine; left ventral on ridge of abdomen. This genus differs from *Citharichthys* only in the smaller size of the mouth and the weaker dentition.

735. Etropus crossotus Jordan & Gilbert.

Etropus crossotus Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881, 364 (Mazatlan); Jordan & Goss, Rept. U. S. Fish Comm., XIV, 1886 (1889), 278; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2689, Pl. CCCLXXXVI, fig. 946; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 200 (Panama).

Etropus microstomus Jordan, Proc. U. S. Nat. Mus., 1886, 29 (not *Citharichthys microstomus* Gill).

Head 4.25 to 4.9; depth 1.9 to 2.4; D. 78 to 83; A. 57 to 66; scales 43 to 49.

Body oval, strongly compressed, the ventral and dorsal curves nearly equal, the dorsal profile from snout to nape only slightly convex; head very small; snout short, rather pointed, 5.5 to 6.4 in head; eye 3.65 to 4.5; interorbital space very narrow, the ridges coalesced, narrower than pupil, even in adult; mouth small, very oblique; maxillary reaching a little past anterior margin of lower orbit, 3.5 to 4.5 in head; teeth small, in a single series, wanting on colored side in upper jaw; gill-rakers shorter than pupil, 7 to 9 on lower limb of first arch; scales rather large, ctenoid on colored side, smooth on blind side; lateral line nearly straight; origin of dorsal over anterior margin of upper orbit, the dorsal and anal fins about equally elevated and coterminal; caudal fin rounded; ventral fins rather small, the left one on ventral ridge; pectoral fin of left side a little larger than the right one, 1.4 to 1.8 in head.

Color brownish, with many irregular dark markings on body and fins, and usually with a well defined black spot at base of caudal. In a series of 45 the caudal spot is wanting on 5 specimens, and on others it is small and indistinct.

The Panama collection contains 73 specimens, ranging in length from 30 to 105 mm. We have 2 larval specimens, respectively 14 and 15 mm. long, which we refer to this species. These juveniles still have the eyes on the opposite sides, although the right one is nearing the dorsal ridge. The mouth is small; the lateral line and scales are undeveloped; and the anterior rays of the dorsal fin are somewhat produced. The left ventral is very large; the rays of the vertical fins are well developed, but those of the pectoral fins are not distinguishable.

We have a single specimen, 80 mm. long, from the Atlantic coast of Panama which is somewhat broader and has a more strongly convex dorsal profile than specimens of the same size from the Pacific coast. We have also examined specimens from South Carolina and Florida and these differences appear to be constant, but they are evident only when specimens of like size are compared. Our Atlantic specimen has practically the same color markings as those from the Pacific, but the dark markings are smaller and less distinct. Were it not for the fact that Jordan & Evermann state that they examined specimens from several localities from both coasts and that the variations with respect to form, color and squamation, which were noticed, intergrade, we should regard the specimen from the Atlantic as a distinct species.

Known from the Pacific coast from Lower California to Panama and on the Atlantic coast from North Carolina to Rio de Janeiro, Brazil. Our Pacific coast specimens are from Chame Point and Balboa and the Atlantic specimen is from Colon. This is a small species, which is of no commercial value, as it rarely reaches a length of 150 mm.

Family LXXXVIII. Soleidæ.

THE SOLES.

Body oblong or elongate; mouth small, much twisted toward the eyed side; teeth very small or obsolete; eyes small, very close together, with or without a bony ridge between them; preopercle adnate, concealed by skin and scales; gill-openings narrow, the membranes adnate to the shoulder girdle above; ventral fins small, one or both wanting; pectoral fins small, one or both wanting. The soles are mostly rather small fishes and they are numerous in the warm seas. Those species that reach a sufficient size are used for food in Panama.

KEY TO THE GENERA.

a. Body short, ovate; eyes and color on the right side; eyes separated by a distinct bony ridge.

b. Gill-openings moderate, confluent below; vertical fins well separated. *Achirus*, p. 994.

bb. Gill-openings reduced to small slits below angle of opercle, separate, not confluent; caudal fin more or less confluent with the dorsal and anal. *Apionichthys*, p. 1003.

aa. Body elongate, more or less lanceolate; eyes and color on the left side; eyes very close together, not separated by a distinct bony ridge; vertical fins confluent; only one ventral fin present; pectoral fins wanting. *Symphurus*, p. 1004.

285. Genus **Achirus** Lacépède.

Achirus Lacépède, Hist. Nat. Poiss., IV, 1803, 658 (type *Pleuronectes achirus* Linnæus).

Trinectes Rafinesque, Atlan. Journ. & Friend of Knowl., I, 1832, 20 (type *Pleuronectes mollis* Mitchill).

Grammichthys Kaup, Archiv. Naturg., XXIV, 1858, 94 (type *Achirus lineatus* Linnæus).

Monochirus Kaup, Archiv. Naturg., XXIV, 1858, 94 (type *Monochirus maculipinnis* Kaup; not of Rafinesque, 1814).

Baiostoma Bean, in Goode & Bean, Proc. U. S. Nat. Mus., 1882, 413 (type *Baiostoma brachialis* Bean).

Body oval, bluntly rounded anteriorly; head small; eyes small, separated by a bony ridge; mouth small, somewhat turned toward the colored side; gill-openings narrow, not confluent below; teeth minute or wanting; color and eyes on the right side; scales very strongly ctenoid, similar on both sides; lateral line simple, nearly straight; origin of dorsal over snout; anal spine wanting; caudal fin free, the peduncle very short; ventral fins both present, the one of colored side often nearly continuous with the anal; pectoral fin of blind side wanting, the one on eyed side small or obsolete.

KEY TO THE SPECIES.

a. Pectoral fin on right, or eyed, side present, often rudimentary (occasionally wanting in *fonsecensis* according to Gilbert & Starks).

b. Body with 13 to 20 pale vertical bars, these sometimes wavy and occasionally ramifying so as to form a network; no hair-like tentacles on the scales on body; D. 53 to 59; A. 42 to 44; scales 85. *scutum*, p. 995.

bb. Body never with pale bars, plain uniform brown or with black vertical bars or lines, or with dark spots and blotches.

c. Color dark brown; head and body with 11 to 13 distinct black cross-bars, at least as broad as pupil and extending on the vertical fins; the vertical fins paler than body and prominently spotted with black; no hair-like tentacles on scales on body; D. 58 to 60; A. 43 to 46; scales 74 to 76. *fonsecensis*, p. 996.

cc. Color either plain brown or the head and body with very narrow dark vertical lines, never with prominent black bars; the fins not notably paler than body, with or without dark spots.

d. Color nearly uniform brown, sometimes with indications of dark blotches and with faint dark vertical lines; scales on colored side with black hair-like tentacles; D. 59 to 63; A. 46 to 48; scales 79 to 81. *klunzingeri*, p. 997.

dd. Color brownish, sometimes with dark blotches and usually with 6 to 8 dark vertical lines; scales on colored side with black hair-like tentacles; D. 50 to 57; A. 38 to 44.

e. Dorsal rays 50 to 55; anal rays 38 to 42; pectoral rays 4 to 6. *lineatus*, p. 998.

ee. Dorsal rays 55 to 57; anal rays 41 to 44; pectoral rays 1 to 4. *mazatlanus*, p. 1000.

aa. Pectoral fins entirely wanting.

f. Body with distinct white spots; scales on body with pale tentacles; D. 49; A. 35. *fimbriatus*, p. 1001.

ff. Body never with white spots; with or without dark spots and very narrow vertical lines; scales on body without tentacles; D. 53 to 57; A. 40 to 43.

g. Scales moderate, 72 to 78 oblique series above lateral line. *fasciatus*, p. 1001.

gg. Scales very small, 90 to 98 oblique series above lateral lines. *fluviatilis* sp. nov., p. 1002.

736. **Achirus scutum** (Günther).

Solea scutum Günther, Cat. Fish. Brit. Mus., IV, 1862, 474 (Gulf of Fonseca; Panama).

Achirus scutum Jordan and Goss, Rept. U. S. Fish Comm., XIV, 1886 (1889), 314; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2700; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 202.

Head 3.33 to 3.6; depth 1.35 to 1.45; D. 53 to 59; A. 42 to 44; scales 85.

Body ovate; head short and deep; snout round, 3.45 to 3.95 in head; eyes about evenly advanced (in one of our specimens they are even, in another the upper is a little in advance of the lower and in a third specimen the lower eye is slightly in advance of the upper), 5.35 to 6.35 in head; interorbital nearly as broad as vertical diameter of eye in large specimens, proportionately narrower in young, 10 to 13 in head; mouth rather small; maxillary reaching anterior margin of pupil, 2.75 to 3 in head; lower lip of eyed side fringed; posterior nostril ending in a broad tube on upper lip; head and body with strongly ctenoid scales, those on upper margin of head somewhat enlarged, blind side of head with very short fleshy tentacles; lateral line nearly straight, prominent on both sides; origin of dorsal over tip of snout, the posterior rays rapidly decreasing in length; caudal fin strongly convex; anal fin similar to the dorsal; ventral fins both present, the one on eyed side scarcely separate from the anal; pectoral fin completely wanting on the blind side, rudimentary on the eyed side, consisting of 3 or 4 rays, the longest ray notably shorter than eye, 5.5 to 12 in head.

Color very dark brown, with pale vertical bars varying in number from 13 to 20; the bars often pursuing a wavy course, and becoming forked or coalesced with an adjacent bar or so wavy and broken up as to form a net-work; these bars extending on the vertical fins and becoming especially distinct on the caudal which may be simply barred or with wavy lines or spotted.

Only 3 specimens were preserved, respectively 129, 138 and 170 mm. in length. This is a well marked species which is occasionally seen in the fish markets.

Known from the Gulf of Fonseca to Panama Bay. Our specimens are from Panama.

737. Achirus fonsecensis (Günther).

Solea fonsecensis Günther, Cat. Fish. Brit. Mus., IV, 1862, 475 (Gulf of Fonseca).

Solea panamensis Steindachner, (Sitzb. k. Ak. Wiss. Wien, LXXIV) Ichth. Beitr., V, 1876, 10, Pl. II (Panama).

Solea fischeri Steindachner, Denkschr. Ak. Wiss. Wien, XLI, 1879, 161, Pl. II, fig. 8 (Rio Mamoni, Panama).

Achirus fonsecensis Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2699; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 201 (Panama Bay); Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 162 (Panama).

Achirus panamensis Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2702.

Achirus fischeri Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2699.

Head 3.5 to 3.9; depth 1.7 to 1.95; D. 58 to 60; A. 43 to 46; scales 74 to 76.

Body ovate; head short; snout round, 3.15 to 3.55 in head; eye rather small, the upper slightly in advance of the lower, 7.35 to 9 in head; interorbital scaly, nearly as broad as vertical diameter of eye, 12 to 18 in head; mouth moderate; maxillary reaching at least to anterior margin of pupil, 2.6 to 2.8 in head; the lower lip on eyed side fringed; posterior nostril ending in a broad tube on edge of upper lip; head and body with strongly ctenoid scales, those on upper part of head somewhat enlarged; blind side of head with long fleshy tentacles; lateral line nearly straight, present on both sides; origin of dorsal over tip of snout, the posterior rays rapidly decreasing; caudal fin rounded; anal fin similar to the dorsal; ventral fins both well developed, the right one almost continuous with the anal; pectoral fin wholly wanting on the blind side, rudimentary on eyed side, consisting of 1 to 3 rays, notably shorter than eye, 10 to 18 in head. (According to Gilbert & Starks both fins occasionally are wanting, but this is not true of any of our specimens; as most of our specimens have 1 small ray, one has 2 and another has 3 rays.)

Color very dark brown, with about 11 to 13 narrow black crossbars on head and body, extending on dorsal and anal fins; the vertical fins paler than body and spotted with black.

This fish is not uncommon on the Pacific coast of Panama. It is represented in the present collection by 10 specimens, ranging in length from 127 to 180 mm. One of our specimens was taken in the Rio Tuyra at the mouth of the Rio Yape, many miles distant from salt water.

Known from Mazatlan to Panama Bay. Our specimens are from Panama City and the Rio Tuyra.

738. **Achirus klunzingeri** (Steindachner).

Solea klunzingeri Steindachner, Denkschr. Ak. Wiss. Wien, XLII, 1880, 96, Pl. IX, fig. 3 (Guayaquil).

Achirus klunzingeri Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2697; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 200

(Panama Bay); Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 162 (Panama).

Head 3.3 to 3.6; depth 1.45 to 1.65; D. 59 to 63; A. 46 to 48; scales 79 to 81.

Body ovate; head short; snout blunt, 3.4 to 3.6 in head; eye small, the upper one slightly in advance of the lower, 8.2 to 11.8 in head; interorbital nearly as broad as eye, completely scaled, 10 to 13 in head; mouth moderate; maxillary reaching nearly opposite middle of lower eye, 2.7 to 2.95 in head; lower lip on eyed side fringed; posterior nostril ending in a broad tube on upper lip; head and body with strongly ctenoid scales; lower two-thirds of opercle and preopercle and subopercle on blind side naked; the scales on left side of head not imbricate and smooth; anterior part of head on blind side with short, fleshy tentacles; right side with patches of fine, black hair-like cilia; lateral line nearly straight, present on both sides; origin of dorsal over snout; caudal strongly convex; anal similar to dorsal; ventral fins well developed, the right one nearly continuous with the anal; pectoral fin of blind side wholly wanting, the right one present, but varying greatly in size and in number of rays, our specimens having from 2 to 5 rays, the longest ray 4.1 to 8.9 in head.

Color almost uniform brown, with indications of dark blotches; a few specimens with very fine and faint dark cross-lines on body; the blind side entirely colorless in all specimens at hand; one specimen with a large colorless triangle at the nape and a smaller one on abdomen; the fins a little lighter in color than the body.

This fish is not infrequently seen in the Panama City market and it is of limited commercial value. We have at hand 6 adult specimens, ranging in length from 206 to 225 mm.

Known from Panama Bay to Guayaquil, Ecuador. Our specimens are from Panama.

739. Achirus lineatus (Linnæus). (Plate CI, fig. 1.)

Pleuronectes lineatus Linnæus, Syst. Nat., Ed. X, 1758, 268 (Jamaica).

Monochir maculipinnis Agassiz, in Spix, Pisc. Brasil., 1831, 88, Pl. XLIX (Brazil).

Monochir lineatus Quoy & Gaimard, in Freycinet, Voy. Uranie et Physicienne, Zoöl., 1824, 238.

Achirus lineatus Valenciennes, in D'Orbigny, Voy. Amér. Mérid., Poiss., V, 1847, Pl. XVI, fig. 2; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2697, Pl. CCCLXXXVI, fig. 947; Fowler, Proc. Ac. Nat. Sci. Phila., 1917, 136 (Colon).

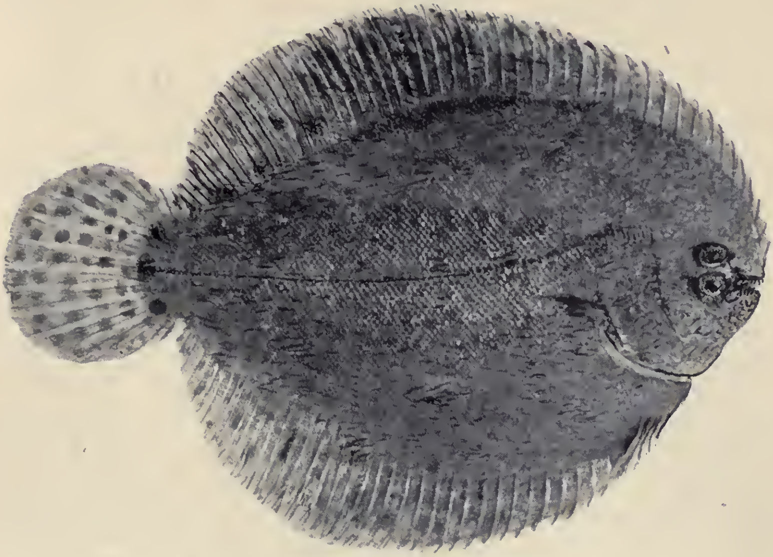

FIG. 1. ACHIRUS LINEATUS (Linnæus).
From a specimen 50 mm. in length.

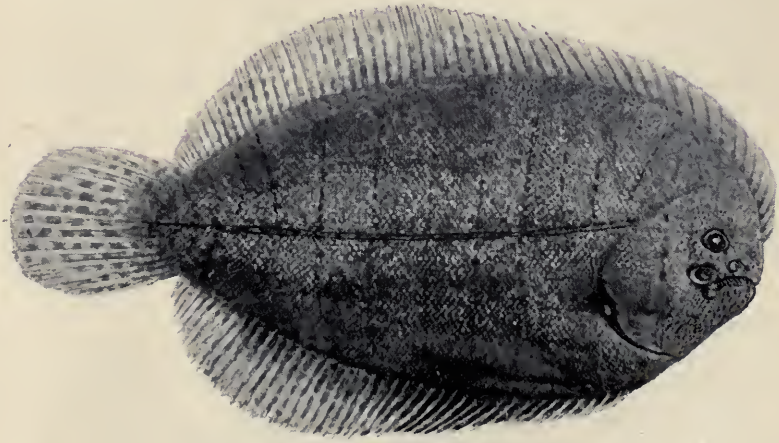

FIG. 2. ACHIRUS MAZATLANUS (Steindachner).
From a specimen 60 mm. in length.

Solea maculipinnis Günther, Cat. Fish. Brit. Mus., IV, 1862, 473.
Baiostoma brachialis Bean, in Goode & Bean, Proc. U. S. Nat. Mus., 1882, 413 (Appalachicola Bay and South Florida).
Bœostoma brachiale Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1882 (1883), 965.
Achirus comifer Jordan & Gilbert, Proc. U. S. Nat. Mus., 1884, 31 (Key West, Fla.).
Achirus brachialis Jordan, Proc. U. S. Nat. Mus., 1884, 149.
Achirus maculipinnis Jordan, Proc. U. S. Nat. Mus., 1886, 602.

Head 3.1 to 3.6; depth 1.5 to 2; D. 50 to 55; A. 38 to 42; scales 70 to 85.

Body ovate; head short, deep; snout short, 3.15 to 4.3 in head; eye 4.75 to 9.5; interorbital narrow, varying greatly with age, nearly as broad as eye in a specimen 133 mm. long, not wider than pupil in specimens 20 mm. in length; mouth small; maxillary reaching to or a little beyond middle of lower eye, 2.6 to 3.5 in head; the lips slightly fringed on eyed side; nostril ending in a broad tube on edge of upper lip; head and body with strongly ctenoid scales, the scales on upper margin of head enlarged and with strong teeth, some of the scales on colored side with black hair-like appendages; lateral line nearly straight, present on both sides; origin of dorsal over tip of snout; caudal fin rounded; anal fin similar to dorsal, its origin a little in advance of posterior margin of opercle; ventral fins present, symmetrical; pectoral fin of eyed side present, consisting of 4 to 6 rays, the second or third ray from the top longest, varying greatly in length among specimens, 1.6 to 3.8 in head.

Color brown, with considerable variation among specimens, some of them being much darker than others; the darkest specimens uniform dark brown, the paler ones with dark spots on the body and fins and some of them also with about 6 very narrow, dark, vertical lines crossing the body; traces of dark vertical lines present on some of the darker specimens having no dark spots.

This species is represented by 50 specimens, ranging in length from 20 to 185 mm. It is the most common sole on the Atlantic coast of Panama. This fish is not infrequently seen in the local fish markets and it has a small commercial value. Specimens exceeding 200 mm. in length are rare.

Known from the Florida Keys, the West Indies and southward to Uruguay. Our specimens are from Mindi Cut, Colon and Porto Bello.

740. Achirus mazatlanus (Steindachner). (Plate CI, fig. 2.)

Solea mazatlana Steindachner, (Sitzb. k. Ak. Wiss. Wien, LX) Ichth. Notizen, IX, 1869, 23 (Mazatlan).

Solea pilosa Peters, Monatsb. k. Ak. Wiss. Berlin, 1869, 709 (Mazatlan).

Achirus mazatlanus Jordan, Proc. U. S. Nat. Mus., 1885, 391; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2698; Kendall & Radcliffe, Memoir. Mus. Comp Zoöl., XXXV, 1912, 161 (Panama).

Head 3.1 to 3.5; depth 1.6 to 1.9; D. 55 to 57; A. 41 to 44; scales 70 to 76.

Body ovate; head short; snout round, 2.9 to 3.6 in head; eye moderate, about evenly advanced, 4.4 to 6.25 in head; interorbital less than half the diameter of eye, 11 to 19 in head; mouth rather small; maxillary reaching anterior margin of pupil, 2.6 to 3 in head; lower lip on eyed side with short fringes; posterior nostril ending in a prominent tube on upper lip; scales strongly ctenoid, wanting on nearly the entire opercle, subopercle and preopercle on blind side in our largest specimen, but present in the smaller ones; the scales imbricate and with very short fleshy tentacles on anterior part of head on blind side; scales on the right side with clusters of fine, black, hair-like cilia, these much more numerous in some specimens than others; lateral line nearly straight and prominent on both sides; origin of dorsal over snout; caudal fin rounded; anal fin similar to the dorsal; ventral fins both well developed, the right one scarcely distinct from the anal; pectoral fin wanting on blind side, rudimentary on eyed side, varying greatly among individuals, consisting of 1 to 4 rays.

Color uniform brown, with about 8 fine, black cross-lines; the lighter colored specimens with large black blotches on body and small dark spots on vertical fins.

We refer 16 small specimens, ranging in length from 25 to 70 mm., to this species. All of our specimens are either from brackish or fresh water. This fish is very closely related to *A. lineatus* from the Atlantic, differing only in the somewhat longer dorsal and anal fins and in the more feebly developed pectoral fin. Much variation in color occurs in both species, but no constant differences are discernable.

Known from Lower California to Panama. Our specimens are from the Rio Chame, Rio Chorrera, Rio Grande, Rio Marte Arnade, and Rio Juan Diaz.

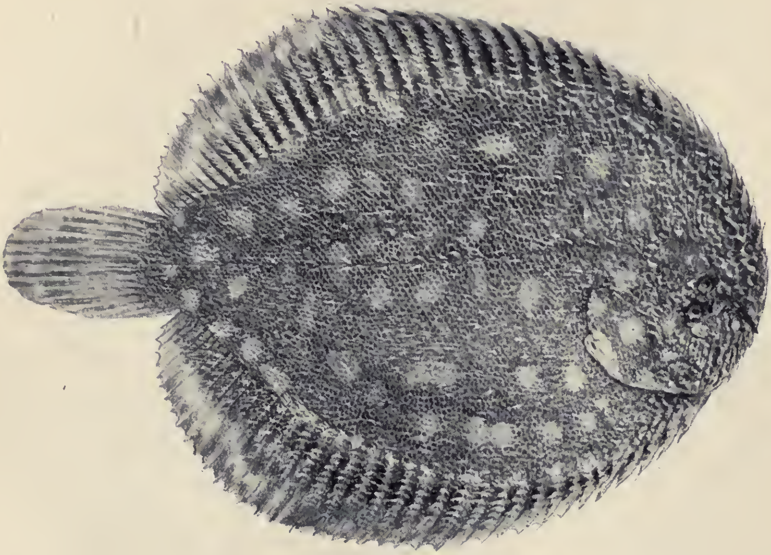

FIG. 1. ACHIRUS FIMBRIATUS (Günther).
From a specimen 70 mm. in length.

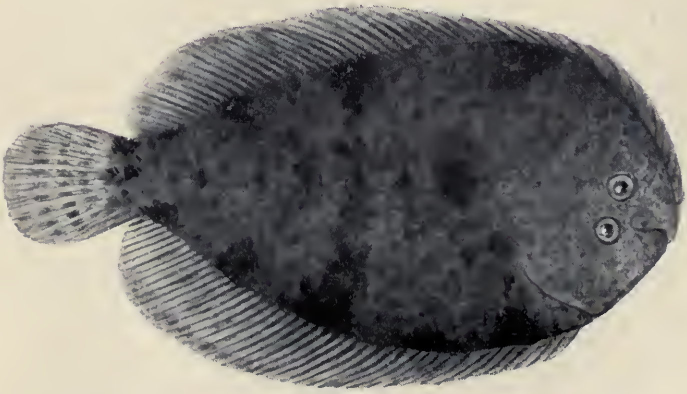

FIG. 2. ARCHIRUS FLUVIATILIS sp. nov.
From the type 50 mm. in length.

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741. Achirus fimbriatus (Günther). (Plate CII, fig. 1.)

Solea fimbriata Günther, Cat. Fish. Brit. Mus., IV, 1862, 477 (Gulf of Fonseca).

Achirus fimbriatus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2700.

Head 3.54; depth 1.5; D. 49; A. 35; scales 74.

Body ovate; head short, deep; snout slightly overhanging mouth, forming a short hook, 3 in head; eye extremely small, the upper in advance of the lower, about 13 in head; interorbital space fully equal to diameter of eye; mouth small; maxillary reaching under lower eye, 2.36 in head; lower lip on eyed side fringed; scales strongly ctenoid, enlarged on anterior part of head, wanting on lower two-thirds of opercle on blind side; scales on body and fins with many pale cirri, these most numerous on anterior part of blind side of head, but elsewhere more numerous on eyed side than blind side; lateral line nearly straight, prominent on both sides; origin of dorsal over tip of snout; caudal fin rounded; anal fin similar to the dorsal; ventral fins well developed, the right one scarcely distinct from the anal; pectoral fins entirely wanting.

Color dark brown, with round or elongate white spots, varying somewhat in size, scattered over the head and body and on the fins; caudal fin paler than the body, causing the white spots to become indistinct; these spots more or less coalesced on the distal parts of the dorsal and anal fins, forming white streaks.

A single specimen, 70 mm. long, which undoubtedly belongs to this little known species, was taken by Mr. Robert Tweedlie at Chame Point and it forms the basis for the above description. Our specimen is somewhat smaller than the type and only specimen heretofore recorded, but it does not vary greatly from the original description, except that the type is said to have no tentacles on the left side of the head which our specimen possesses, and no mention is made of the many tentacles elsewhere on the body.

Previously known only from the Gulf of Fonseca, the range now being extended to Panama Bay. The specimen at hand is from Chame Point.

742. Achirus fasciatus Lacépède.

Achirus fasciatus Lacépède, Hist. Nat. Poiss., IV, 1803, 659, 662 (Charleston, S. C.); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2700, Pl. CCCLXXXVII, fig. 948.

Pleuronectes mollis Mitchill, Trans. Lit. & Phil. Soc. N. Y.; I, 1815, 388, Pl. II, fig. 4 (New York).

Pleuronectes apoda Mitchill, Amer. Monthly Mag., II, 1818, 244 (Straits of Bahama).

Trinectes scabra Rafinesque, Atlan. Journ. & Friend of Knowl., I, 1832, 20 (Pennsylvania, in fresh water).

Solea brownii Günther, Cat. Fish. Brit. Mus., IV, 1862, 477 (New Orleans; Texas).

Head 2.87 to 4; depth 1.7 to 1.95; D. 53 to 55; A. 40 to 42; scales 72 to 78.

Body broad; head short and deep; snout very short, 3.4 to 5.7 in head; eye 8.3 to 10.5; interorbital about 10; mouth small; the maxillary reaching just past anterior margin of lower eye, 2.65 to 3.75 in head; lower lip on eyed side fringed; nostril ending in a broad tube on edge of upper lip; head and body with strongly ctenoid scales, those on upper margin of head enlarged and with prominent teeth, none of the scales with hair-like or filamentous appendages; lateral line present on both sides; origin of dorsal over tip of snout, the fin about evenly convex; caudal fin round; anal fin similar to dorsal, its origin under vertical of opercular margin; ventral fins present, the right one scarcely separate from anal; pectoral fins wholly wanting.

Color of young specimen, 30 mm. long, dark brownish, with a single dark vertical bar at shoulder and many dark spots on body and fins; adult, 165 mm. long, plain brown, with 12 black cross-lines on head and body.

Two specimens, 30 and 165 mm. in length, occurring in the present collection, we refer to this species. One was taken in a muddy, fresh water creek and the other from strictly salt water along shore.

Known from Massachusetts to Texas, the range now being extended to Panama. Our specimens are from Mindi Creek and Toro Point, Canal Zone.

743. **Achirus fluviatilis** sp. nov. (Plate CII, fig. 2.)

Type No. 81667, U. S. N. M.; length 50 mm.; Rio Juan Diaz, Panama.

Head 3.25 to 3.4; depth 1.8 to 1.9; D. 53 to 57; A. 41 to 43; scales 90 to 98.

Body ovate; head short and deep; snout round, 3.25 to 3.95 in head; eyes moderate, the upper one a little in advance of the lower, 4.4 to 5.4 in head; interorbital space about half the eye in specimens 50 mm. long; mouth rather small; maxillary reaching a little beyond anterior margin of eye, 2.5 to 2.85 in head; lower lip on eyed side with short fringes; scales on head and body, none of them having hair-like cilia; anterior margin of head with short tentacles; lateral line nearly straight, prominent on both sides; origin of dorsal over snout; caudal rounded; anal similar to dorsal; ventral fins well developed, the right one scarcely distinct from the anal; pectoral fins entirely wanting.

Color brownish, head and body crossed by about 10 dark cross-lines, and with large dark blotches; the fins with small dark spots, these most distinct on the caudal fin.

This species is represented by 25 specimens, ranging in length from 25 to 50 mm. It is very closely related to *A. fasciatus* from the Atlantic, from which it appears to differ principally in the smaller scales. All of our specimens were taken in fresh water, from streams below the head of tide.

Specimens were secured in the Rio Juan Diaz, Rio Chorrera, and in the rios Mamoni, Culebra and Calobre, tributaries of the Rio Bayano.

286. Genus **Apionichthys** Kaup.

Apionichthys Kaup, Archiv. Naturg., XXIV, 1858, 104 (type *Apionichthys dumerili* Kaup).

Soleotalpa Günther, Cat. Fish. Brit. Mus., IV, 1862, 489 (type *Soleotalpa unicolor* Günther).

This genus differs from *Achirus* in having the gill-openings reduced to slight slits below angle of opercle; the left ventral is rudimentary, being composed of only 2 or 3 rays; the right ventral begins at the chin and is confluent with the anal; the pectoral fins are very small or wanting; and the caudal fin is more or less confluent with the dorsal and anal; small ctenoid scales are present and the lateral line is straight.

745. Apionichthys dumerili Kaup.

Apionichthys dumerili Kaup, Archiv. Naturg., XXIV, 1858, 104 (no locality); Bleeker, Nederl. Tijdsch. Dierk., II, 1865, 307.

Soleotalpa unicolor Günther, Cat. Fish. Brit. Mus., IV, 1862, 489 (West Indies).

Apionichthys nebulosus Peters, Monatsb. k. Ak. Wiss. Berlin, 1869, 709 (Surinam).

Apionichthys unicolor Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2702.

Head 4.5; depth 2.75; D. 76 to 78; A. 56 or 57; scales 92 to 100.

Body very flat and thin; snout bent downward, forming a hook overhanging the mouth; eyes very small, being mere points; interorbital rather broad; cleft of mouth curved; gill-openings reduced to small slits, the membrane being attached to the throat; origin of dorsal over tip of snout, slightly connected with the caudal; caudal fin quite pointed; anal fin similar to the dorsal; left ventral fin rudimentary, consisting of 2 or 3 rays, the right ventral beginning at chin and continuous with the anal.

Color brownish, mottled with dark spots, or freckled with dark brown specks.

Recorded from the West Indies and the coast of Brazil. It is not yet recorded from Panama and was not seen by us. The above description is compiled from published accounts.

287. Genus **Symphurus** Rafinesque.

Symphurus Rafinesque, Ind. d'Itt. Sicil., etc., 1810, 13, 52 (type *Symphurus nigrescens* Rafinesque).

Plagusia Cuvier, Règne Animal, Ed. I, II, 1817, 224 (type *Pleuronectes plagiusa* Linnæus; name preoccupied in Crustaceans, Latreille, 1806).

Plagiusa Bonaparte, Icon. Fauna Ital., Pesce, III, 1837, fasc. 120 (type *Pleuronectes plagiusa* Linnæus; substitute for *Plagusia,* preoccupied).

Bibronia Cocco, Intor. Alcun. Pesci Messina, 1844, 15 (type *Bibronia ligulata* Cocco).

Aphoristia Kaup, Archiv. Naturg., XXIV, 1858, 106 (type *Achirus ornatus* Lacépède).

Glossichthys Gill, Proc. Ac. Nat. Sci. Phila., 1861, Suppl., 51 (type *Pleuronectes plagiusa* Linnæus).

Ammopleurops Günther, Cat. Fish. Brit. Mus., IV, 1862, 490 (type *Plagusia lactea* Bonaparte).

Acedia Jordan, in Jordan & Goss, Rept. U. S. Fish Comm., XIV, 1886 (1889), 321 (type *Aphoristia nebulosus* Goode & Bean).

Body quite elongate; eyes and color on left side; eyes small, very close together, without distinct interorbital ridge; mouth rather small, twisted toward the blind side; teeth little developed, in villiform bands; gill-openings rather small, the membranes joined together below and free from the isthmus; scales ctenoid; lateral line wanting; vertical fins confluent; only one ventral fin present, situated on ridge of abdomen; pectoral fins wanting, at least in adult.

KEY TO THE SPECIES.

a. Body moderately elongate, depth 3.4 to 4; head 4.6 to 5.4; D. 86 to 92; A. 72 to 80; scales 88 to 92; body usually with dark cross-bars, often with dark lines along the rows of scales; dorsal and anal fins usually black, at least posteriorly. *plagusia,* p. 1005.

aa. Body very elongate, depth 3.7 to 4.4; head 4.9 to 5.6; D. 98 to 105; A. 83 to 86; scales 90 to 95; body usually with dark cross-bars and with a dark blotch on opercle, often with dark lines along the rows of scales; dorsal and anal fins usually black, at least posteriorly. *elongatus,* p. 1006.

aaa. Body quite elongate, depth 3.7 to 4.2; head 4.3 to 4.6; D. 90 to 100; A. 70 to 79; scales 88 to 100; body with 3 or 4 broad black cross-bars, and distinct dark lines along the rows of scales; dorsal and anal fins black posteriorly. *leei,* p. 1007.

aaaa. Body elongate, depth 3.3 to 3.5; head 4.7 to 5.1; D. 88 to 90; A. 74 to 76; scales 102 to 109; body with irregular dark bars and blotches, posteriorly with indications of grayish bars, no dark lines along the rows of scales; dorsal and anal dusky posteriorly and with 3 or 4 prominent jet black spots. *atramentatus,* p. 1008.

aaaaa. Body rather deep, the depth 3.3 to 3.4; head 5.25 to 5.7; D. 84 to 97; A. 78 to 85; scales 106 to 114; body usually with black cross-bars and dark lines along the rows of scales; dorsal and anal fins posteriorly black. *atricaudus,* p. 1009.

746. Symphurus plagusia (Bloch & Schneider).

Pleuronectes plagusia Bloch & Schneider, Syst. Ichth., 1801, 162 (Jamaica).

Achirus ornatus Lacépède, Hist. Nat. Poiss., IV, 1803, 659 (on a specimen "presented by Holland to France").

Plagusia tessellata Quoy & Gaimard, in Freycinet, Voy. Uranie et Physicienne, Zoöl., 1824, 240 (Rio de Janeiro).

Plagusia brasiliensis Agassiz, in Spix, Pisc. Brasil., 1829, 89, Pl. L (Brazil).

Aphoristia ornata Kaup, Archiv. Naturg., XXIV, 1858, 106.

Aphoristia plagiusa Jordan, Proc. U. S. Nat. Mus., 1886, 53 (not of Linnæus).

Symphurus plagusia Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2709; Fowler, Proc. Ac. Nat. Sci. Phila., 1917, 136 (Colon).

Head 4.6 to 5.4; depth 3.4 to 4; D. 86 to 92; A. 72 to 80; scales 88 to 92.

Body quite elongate; head short, rounded anteriorly; snout 3.5 to 4; eyes rather small, very close together, the upper in advance of the lower, 7.2 to 10 in head; mouth moderate; maxillary reaching past middle of lower eye, 3.5 to 4 in head; scales covering entire body, reduced on head; origin of dorsal over eye; caudal fin pointed, confluent with the dorsal and anal; a single ventral fin present, situated on abdominal ridge, well separated from the anal, consisting of 4 rays; pectoral fins wanting.

Color dark brown to pale brown, usually with black cross-bars; the paler specimens freckled with brown specks; some specimens with indications of dark lines along the rows of scales; the vertical fins mostly black in the darker colored specimens, only slightly dusky in the lighter specimens.

This species is not uncommon on the Atlantic coast of Panama where it occurs on muddy bottom. It is represented by 14 specimens, ranging in length from 50 to 95 mm. We have compared our specimens with examples from Port Tampa, Fla., which appear to have larger scales (72 to 78) and somewhat shorter dorsal (84 to 86) and anal (69 to 71) fins. The present species, therefore, is regarded here as distinct from *S. plagiusa,* although the examination and comparison of more specimens may reveal intermediate forms.

This species as here understood ranges from the West Indies southward to the coast of Uruguay. Our specimens are from Colon and Porto Bello.

747. **Symphurus elongatus** (Günther).

Aphoristia ornata var. *elongata* Günther, Trans. Zoöl. Soc. London, VI, 1869, 473 (Panama).

Aphoristia elongata Jordan & Gilbert, Bull. U. S. Fish Comm., II, 1882 (1883), 111 (Panama).

Symphurus elongatus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2707; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 203 (Panama Bay).

Head 4.9 to 5.6; depth 3.7 to 4.4; D. 98 to 105; A. 83 to 86; scales 90 to 95.

Body very elongate; head rather short, rounded anteriorly; snout 4 to 6 in head; eyes very close together, without distinct interorbital ridge, the upper one a little in advance of the lower, 9 to 11.5 in head; mouth curved; maxillary reaching under middle of lower eye, 3.4 to 3.6 in head; scales ctenoid, covering entire body, reduced on anterior part of head; origin of dorsal over eye; caudal fin pointed, confluent with the dorsal and anal; only one ventral present, situated on ridge of abdomen, well separated from the anal, consisting of 4 or 5 rays; pectoral fins wanting.

Color brown, sometimes more or less mottled, and usually with black cross-bars; one of our specimens plain brown, with no indication of dark bars or other markings, except a dark blotch on lower part of opercle; usually with an indication of dark lines along the rows of scales; vertical fins mostly black in the adult, only the caudal black in the young.

Only 3 specimens, ranging in length from 50 to 225 mm., were preserved, but we have had other specimens from Panama for comparison. This fish is occasionally seen in the market where our largest specimens were secured. The species is closely related to *S. plagusia* of the Atlantic, but the specimens at hand have longer dorsal and anal fins and somewhat smaller scales. The present species also appears to reach a larger size.

Recorded from the Pacific coast of Central America. Our specimens are from the Panama City market.

748. **Symphurus leei** Jordan & Bollman.

Symphurus leei Jordan & Bollman, Proc. U. S. Nat. Mus., 1889, 178 (Albatross Stations 2800, 2802, 2803 and 2804, Panama Bay); Jordan & Evermann, Bull. U. S. Mus., XLVII, 1898, 2708; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 204.

Head 4.3 to 4.6; depth 3.7 to 4.2; D. 90 to 100; A. 70 to 79; scales 88 to 100.

Body quite elongate; head large; snout short, blunt, 6.6 to 7.1 in head; eyes moderate, very close together, the upper a little in advance of the lower, 7.4 to 8.3 in head; mouth little curved; maxillary reaching nearly to posterior margin of eye, 3.6 in head; scales small, less firm than in related species, many of them being lost from specimens at hand, closely covering head and body; origin of dorsal over upper eye; caudal fin pointed, confluent with the dorsal and anal; a single ventral fin present, inserted on ventral ridge, under edge of gill-membranes, well separated from the anal, consisting of 3 or 4 rays; pectoral fins entirely wanting.

Color brownish, speckled with darker and with 3 or 4 broad black cross-bars; the rows of scales without distinct lines; the posterior part of vertical fins black.

This species was taken in Panama Bay by the Albatross but it was not seen there by us. The above description is based upon specimens, ranging in length from 90 to 115 mm., taken at Albatross Station 2804. This fish may be distinguished from related species by the longer head and the larger opercular flap. The scales are also less firmly adherent than in the closely related forms.

Known only from specimens dredged by the Albatross in Panama Bay at Stations 2800, 2802, 2803 and 2804, in depths ranging from 7 to 51.5 fathoms.

749. Symphurus atramentatus Jordan & Bollman.

Symphurus atramentatus Jordan & Bollman, Proc. U. S. Nat. Mus., 1889, 177 (Panama Bay, Albatross Stations 2795, 2797 and 2805); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2706; Garman, Memoir. Mus. Comp. Zoöl., XXIV, 1899, 229 (Panama Bay); Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 203.

Head 4.7 to 5.1; depth 3.3 to 3.5; D. 88 to 90; A. 74 to 76; scales 102 to 109.

Body elongate; head small; snout short, the point overhanging mouth, 4.8 to 6; eyes very close together, without interspace, the upper a little in advance of the lower, 6 to 6.9 in head; mouth moderate; maxillary reaching past pupil of lower eye, 4.2 to 4.5 in head; scales quite firm, small, strongly ctenoid, covering entire head and body; origin of dorsal over anterior part of upper eye; caudal fin pointed, confluent with the dorsal and anal; a single ventral fin present, inserted on ventral ridge, under margin of gill-membranes; pectoral fins wanting.

Color light brown, irregularly barred and blotched with darker; also with indications of grayish bars, most distinct on the posterior part of body; dorsal and anal fins pale anteriorly, becoming somewhat dusky posteriorly; each fin anteriorly with 4 to 7 dusky areas covering 3 or 4 rays, posteriorly with 3 or 4 prominent jet black spots.

This species was not taken by us. It is here described from 5 specimens, ranging in length from 90 to 105 mm., taken by the Albatross in Panama Bay at Station 2795. The species is closely related to *S. atricaudus,* from which it, however, is readily distinguished by the coloration. We are unable to verify the statement that the eyes and scales of this species are larger, as stated by authors, for these characters intergrade and, if the differences exist, the fact could be determined only by the examination of large series.

Known from Panama Bay and the Galapagos Islands.

748. Symphurus atricaudus (Jordan & Gilbert).

Aphoristia atricauda Jordan & Gilbert, Proc. U. S. Nat. Mus., 1880, 23 (San Diego); Eigenmann, Ann. N. Y. Ac. Sci., VII, 1894, 632 (Panama).

Symphurus atricaudus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2707; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 204.

Head 5.25 to 5.7; depth 3.3 to 3.4; D. 84 to 97; A. 78 to 85; scales 106 to 114.

Body rather deep; head short; snout blunt, 5.45 to 6 in head; eyes moderate, very close together, no distinct interorbital ridge; the upper eye a little in advance of the lower, 6 to 6.9 in head; mouth somewhat curved; maxillary reaching under middle of eye, 4.2 to 4.5 in head; scales small and firm, closely covering entire head and body; origin of dorsal over upper eye; caudal fin pointed, confluent with the dorsal and anal; a single ventral present, inserted on ridge under edge of gill-membranes, well separated from the anal, consisting of 4 rays; pectoral fins entirely wanting.

Color brownish, usually with dark cross-bars and with streaks along the rows of scales; the streaks formed by dark spots on the scales; vertical fins black posteriorly.

This species has been listed from Panama by Eigenmann, but it has not been taken there by recent collectors. The above description is based upon specimens from the National Museum collection, taken at San Diego, Cal., ranging in length from 85 to 110 mm. The species appears to differ from *S. elongatus* in the deeper body, smaller scales and in the slightly longer dorsal fin.

Known from San Diego, Cal., to Panama Bay.

Order XV. Pediculati.

Family LXXXIX. **Antennariidæ.**

THE FROG-FISHES.

Body elongate, more or less compressed; head short, robust; mouth very oblique or vertical; lower jaw in advance of the upper; premaxillaries protractile; gill-opening small, at or behind base of lower rays of pectoral; skin naked, smooth or prickly; spinous dorsal consisting of 1 to 3 separate spines, the first one usually tentacle-like; the soft dorsal long, larger than anal; ventral fins present, jugular, rather close together; pectoral fins with a sort of wrist, forming an elbow-like angle with the rest of the fin. A family of peculiarly shaped fishes of the tropical seas, most of the members living in floating seaweed with which they sometimes appear to be drifted for long distances from their usual habitat. Two genera are represented in the Panama collection.*

KEY TO THE GENERA.

a. Skin smooth, without prickles; ventral fins well developed, long, often reaching nearly or quite to origin of anal. *Histrio*, p. 1010.

aa. Skin rough to the touch, provided with granules or spinules; ventral fins quite short, usually scarcely reaching under base of pectorals. *Antennarius*, p. 1011.

288. Genus **Histrio** Fischer.

Histrio Fischer, Zoögnosia, Tab. Syn., Ed. III, I, 1813, 70, 78 (type *Lophius histrio* Linnæus).

Pterophryne Gill, Proc. Ac. Nat. Sci. Phila., 1863, 90 (type *Chironectes lævigatus* Cuvier).

Pterophrynoides Gill, Proc. U. S. Nat. Mus., 1878, 216 (substitute for *Pterophryne*, regarded as preoccupied).

Body short, somewhat compressed; mouth small, oblique; palatine teeth present; skin smooth or with minute tubercles and with dermal tentacles; the soft dorsal preceded by 3 spines, a small, slender spine with "bait" in advance of the large rostral spine; ventral fins well developed, rather long; wrist and pectoral fins slender. A group of oddly shaped fishes, living in dense vegetation which they grasp with their hand-like pectorals. Two species are recognized from American waters (Atlantic Ocean), but only one was seen on the coast of Panama.

751. **Histrio gibbus** (Mitchill).

Lophius gibbus Mitchill, Trans. Lit. & Phil. Soc. N. Y., I, 1815, Pl. IV, fig. 9 (off St. Croix).

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*The measurements given for the various characters of the species of this family are at best only approximate, owing to the peculiar structure of the fish. The head was measured from the margin of the opercular bone which may be felt underneath the skin, and the depth was measured at vertical from the origin of the third dorsal spine.

Pterophryne gibba Garman, Bull. Lab. Nat. Hist. Univ. Iowa, IV, 1896, 81; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2717.

Head 2.7 to 3.25; depth 1.8 to 2; D. III, 12; A. 7.

Body rather short, compressed, deep anteriorly; head short, compressed; snout very short and blunt, 3.5 to 5 in head; eye 2.8 to 3.75; interorbital 3.1 to 3.6; mouth moderate, very oblique; maxillary reaching nearly to vertical from posterior margin of eye, 1.85 to 2.15 in head; teeth pointed, present on jaws and palatines, rather long, directed inward, more or less distinctly in narrow bands; gill-opening very small, appearing as a mere pore on lower margin of pectoral near base of wrist; scales wanting, the skin with tubercles, and with dermal tentacles variously distributed, these longest and most numerous on abdomen; dorsal fin preceded by 3 separate spines, the first spine very slender, with the bulbous "bait" covered with fleshy filaments or merely with fleshy folds; the first spine closely succeeded by a large rostral spine with many dermal tentacles, another large spine with dermal fringes at nape; the soft dorsal rather high, with a convex margin; caudal fin round; anal fin short and high; ventral fins well developed, reaching opposite origin of anal in the largest specimen at hand, failing to reach this point in the smaller ones; pectoral fins provided with a long, well marked wrist of about the same length as the fin; the fin round in outline, the ends of the rays free, 1.1 to 1.5 in head.

Color in life largely orange, with irregular brown spots and bars; the caudal fin and the posterior part of the dorsal and anal fins often rather distinctly barred. The color appears to vary considerably among individuals, the brown predominating on some specimens while on others the yellow predominates.

Only 3 specimens of this species, ranging in length from 20 to 60 mm., were collected. They were taken in very quiet shallow water in dense masses of green algæ. A second species, *H. histrio* (Linnæus), may be expected on the Atlantic coast of Panama. Its relationship with *H. gibbus,* however, is very imperfectly understood, but it appears to have the "bait" on first dorsal spine bifid instead of bulbous and the soft dorsal is probably slightly longer, being composed of 14 rays.

Known from Key West, the Tortugas, and the West Indies. The range is now extended to the Isthmus of Panama. Our specimens are from Colon and Porto Bello.

289. Genus **Antennarius** Commerson.

Antennarius Commerson, in Lacépède, Hist. Nat. Poiss., I, 1798, 327 (type *Lophius commersonianus* Lacépède).

Chironectes Cuvier, Mém. Mus. Hist. Nat. Paris, III, 1817, 418 (type *Lophius commersonianus* Lacépède).

Body oblong, more or less compressed, very deep anteriorly; mouth rather large, very oblique to vertical; teeth pointed, in bands on jaws and palatines; gill-opening very small, situated just below base of the lower rays of pectoral fin; skin provided with granules or spinules and usually with fleshy cirri; first dorsal spine developed as a slender rostral tentacle, usually bearing a fleshy lobe or "bait" at its tip; the second and third dorsal spines strong; caudal peduncle free; ventral fins short; pectoral fins longer and broader than ventrals, with a wide wrist.

KEY TO THE SPECIES.

a. The bulbus tip or "bait" of the first dorsal spine bifid, the base of this spine projecting in advance of upper lip; the prickles on skin trifid, the median projection soft, the lateral ones pointed, bony; D. III-12; A. 7. *scaber,* p. 1012.

aa. The bulbous tip or "bait" simple, not as above; the prickles on skin simple or bifid.

b. Prickles on skin mostly bifid; the base of first dorsal spine not projecting in advance of upper lip; D. III-13; A. 8; ground color reddish in life, brownish in spirits.

c. First dorsal spine notably shorter than the second, the "bait" forming a distinct bulb; body not everywhere spotted with brown; abdomen plain, not reticulated or spotted; a large black ocellus at base of longest dorsal rays. *sanguineus,* p. 1013.

cc. First dorsal spine notably longer than the second, the "bait" elongate, not distinctly bulbous; body everywhere spotted with brown and black; the abdomen more or less distinctly reticulated. *strigatus,* p. 1014.

bb. Prickles on skin probably simple, no cutaneous fringes; D. III-11; A. 7; ground color black; a small white spot above pectoral; tips of pectorals and ventrals white. *principis,* p. 1015.

752. **Antennarius scaber** (Cuvier).

Chironectes scaber Cuvier, Mém. Mus. Hist. Nat. Paris, III, 1817, 425, Pl. XVI, fig. 2 (Martinique).

Lophius spectrum Gronow, Cat. Fish, 1854, 49 (Antilles).

Antennarius scaber Jordan, Proc. U. S. Nat. Mus., 1889, 652 (St. Lucia); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2722.

Head 2.7 to 3.35; depth 1.7 to 2.15; D. III-12; A. 7.

Body robust, deepest anteriorly; head short and blunt; snout very short, 3.3 to 5 in head; eye small, 4 to 6; interorbital 2.7 to 3.1; mouth vertical; maxillary 1.2 to 1.9 in head; teeth small, pointed, in bands on jaws and palatines; gill-opening very small, situated at base of lower rays of pectoral; the skin very rough, covered with prickles which are trifid at tips; the outer serræ of each prickle bony, pointed and directed slightly backward, the median one soft and fleshy; slender cutaneous tentacles present on head and sides, most numerous about the mouth and along the lateral line; dorsal preceded by three separate spines; the first spine slender, its base projecting in advance of the upper lip; the "bait" bifid, the lobes of the "bait" spongy, composed of membranous folds, projecting beyond rostral spine and resting in a quadrate, depressed, naked area posterior to the rostral spine; the rostral spine and the spine at nape both short and with dermal fringes; the soft dorsal moderately elevated, with convex margin; caudal fin longer than head, with evenly convex margin; anal fin moderately elevated, with convex margin; ventral fin short, notably shorter than pectorals; pectoral fins short, without distinct wrist, 1.25 to 1.5 in head.

Color brownish to very dark reddish; sides and fins with dark spots, these sometimes forming indistinct radiating lines from eye; the spots large and round on the fins and frequently with slight ocellation; mouth spotted with black within. Our specimens appear to be darker in color than those described and figured from the West Indies. The following color description, based on a small fresh specimen from Fox Bay, Colon, is from our field notes: "Gray, with dark bluish stripes, these nearly vertical on anterior part of body and running upward and backward on posterior part of body; fins mottled with darker."

This singular species is represented in the collection by 5 specimens, ranging in length from 50 to 85 mm.; all taken with seines in dense vegetation.

Known from Curaçao, Trinidad, Porto Rico, St. Lucia and Martinique. The range is now extended to the Atlantic coast of Panama. Our specimens are from Colon and Porto Bello.

753. **Antennarius sanguineus** Gill.

Antennarius sanguineus Gill, Proc. Ac. Nat. Sci. Phila., 1863, 91 (Cape San Lucas); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2721; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 204.

Antennarius leopardinus Günther, Proc. Zoöl. Soc. London, 1864, 151 (Panama).

Head 2.7 to 3.6; depth 1.7 to 1.9; D. III-13; A. 8.

Body robust, deep anteriorly; head blunt; snout very short, 2.6 to 4.7 in head; eye small, 3.8 to 5; interorbital 2.3 to 3.8; mouth vertical; maxillary rather broad, 1 to 1.5 in head; teeth pointed, in bands on jaws and palatines; skin rough, with bifid prickles; short dermal tentacles present about the mouth and along upper part of sides; dorsal fin preceded by 3 spines; the first spine short and slender, not reaching the tip of the second spine, ending in a membranous bulb or "bait"; the second spine wholly free; the third posteriorly attached by membrane, but capable of being erected perpendicularly; the soft dorsal rather high, with convex margin; caudal fin rather long, rounded; anal fin similar to second dorsal but much shorter; ventral fins short, with 5 rays; pectoral fins longer and broader, with 13 rays and a distinct wrist, the fin without wrist 1 to 1.35 in head.

Color blood-red in life; dark brown in spirits; a few indefinite dark spots on side below base of third dorsal spine; a small but distinct one on middle of side above base of pectoral; a large ocellated spot at base of longest dorsal rays; the abdomen plain, unspotted; the distal parts of the fins spotted with black; the caudal fin often with indistinct dark cross-bars; inside of mouth spotted with black, the floor with two more or less distinct longitudinal bands.

This species is represented by 8 small specimens, ranging in length from 30 to 63 mm. Some of the specimens are much lighter in color than others but the general pattern is uniform.

Known from Cape San Lucas to Panama. The smallest specimen was sent from Chame Point by Mr. Robert Tweedlie. Two were taken by us in a tide pool at Panama City and the others were brought to the Panama City market by fishermen.

754. **Antennarius strigatus** Gill.

Antennarius strigatus Gill, Proc. Ac. Nat. Sci. Phila., 1863, 92 (Cape San Lucas); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 630; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2720; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 204.

Antennarius tenuifilis Günther, Trans. Zoöl. Soc. London, VI, 1869, 440 (Panama).

Body compressed, deep anteriorly; head short, blunt; snout very short, 2.85 in head; eye very small, 12 in head; interorbital 2.5; mouth vertical, the lower jaw notably in advance of the upper; maxillary broad, 1.3 in head; teeth pointed, in narrow bands on jaws and palatines; skin rough, covered with prickles which are mostly bifid; a few short dermal tentacles about the mouth and on head; dorsal fin preceded by 3 spines; the first spine long and slender, much longer than the rostral spine, with a slender dermal tip or "bait"; the second spine short, robust, attached by membrane posteriorly; the third spine concealed in the skin, appearing as a hump; second dorsal low, the rays covered with heavy skin, except at tips; caudal fin moderate, rounded; anal fin similar to second dorsal but shorter; ventral fins very short, resembling the feet of a mole, having 5 rays, with free tips; pectoral fins longer and broader, with 11 rays and a distinct wrist, the fin without wrist 2.1 in head.

Color of fresh specimen blood-red, everywhere spotted with brown; the brown spots forming more or less distinct reticulations on the abdomen; small jet-black spots appearing more or less definitely in clusters on paler areas also present; one of these clusters situated a short distance behind the eye, another above and slightly in front of base of pectoral, and one each on the base of the longest rays of dorsal and anal fins; an indistinct saddle-like blotch between the second and third dorsal spines; another broad dark band from origin of second dorsal, downward and forward to above middle of side, thence backward and downward to upper axil of pectoral; the distal parts of the fins spotted with black; the caudal with indefinite vertical bars; the mouth spotted and streaked with black and brown within.

We have a single large specimen, 250 mm. in length,, which we refer to this species. The eye of this fish is very small and it does not have the appearance of a functional organ. The cornea is continuous with the skin of the head and no pupil is discernible externally.

Known from Cape San Lucas to Panama. Probably a rare species, as our specimen was brought to the Panama City market by fishermen, as a curio.

755. **Antennarius principis** (Cuvier & Valenciennes).

Chironectes principis Cuvier & Valenciennes, Hist. Nat. Poiss., XII, 1837, 416 (Brazil; on 2 drawings by Prince Maurice, the second figure representing the present species to which Günther restricted the name *principis).*

Antennarius principis Günther, Cat. Fish. Brit. Mus., III, 1861, 193;

Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2719.

D. III-11; A. 7; P. 10.

Anterior dorsal spine twice as long as second, ending in a small, slender lobe; membrane behind third spine extending to root of soft dorsal; last ray of dorsal not reaching caudal. Skin rough, covered with small spines; no cutaneous fringes. Black; tips of pectorals and ventrals white; a small white spot above pectoral. (Günther.)

This fish is recorded from the West Indies and Brazil and may therefore be expected on the coast of Panama. It was not seen by us.

Family XC. **Ogcocephalidæ.**

THE BAT-FISHES.

Body depressed, the trunk short and slender; head very broad, much depressed; snout more or less elevated, usually projecting; mouth not large, usually inferior, the lower jaw included; teeth pointed; gill-openings small, above and behind axils of pectoral fins; skin covered with bony tubercles or spines; a rostral tentacle, retractile into a cavity under the rostral process, usually present; dorsal and anal small; ventrals present; pectorals well developed, with strongly angled base. The bat-fishes are of a peculiar shape; most of them apparently are sluggish in their movements. Some of the species live along the shores in very shallow water and others inhabit the deep sea. Two genera come within the scope of the present report.

KEY TO THE GENERA.

a. Disk with the frontal region more or less elevated; eyes wholly lateral; gills 2½.

b. Disk longer than broad.	*Ogcocephalus*, p. 1016.
bb. Disk notably broader than long.	*Zalieutes*, p. 1018.

290. Genus **Ogcocephalus** Fischer.

Ogcocephalus Fischer, Zoögnosia, Tab. Syn., Ed. III, I, 1813, 70, 78 (type *Lophius vespertilio* Linnæus).

Malthe Cuvier, Règne Animal, Ed. I, II, 1817, 311 (type *Lophius vespertilio* Linnæus).

Body depressed; head broad, triangular or more or less disk-like in form, not broader than long; snout provided with a rostral projection, varying greatly in length; eyes rather large, lateral; mouth moderate, inferior; teeth in villiform bands on jaws, vomer and palatines; gill-opening small, near inner axil of pectoral; gills 2½; skin rough, with bony tubercles; a dermal tentacle present under the rostral process, retractile into a well developed cavity; ventrals I, 5, well separated; pectorals large, placed horizontally. A single species is represented in the Panama collection.

756. Ogcocephalus vespertilio (Linnæus).

Lophius vespertilio Linnæus, Syst. Nat., Ed. X, I, 1758, 236 (American seas).

Malthea vespertilio Cuvier & Valenciennes, Hist. Nat. Poiss., XII, 1837, 440.

Ogcocephalus vespertilio Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2737, Pl. CCCXCII, figs. 958, 958a and 958b.

Head to gill opening 1.93; depth 5; D. 4; A. 4.

Body rather robust, tapering backward; the caudal peduncle broader than deep; head broad, depressed, triangular, the greatest width equal to distance from tip of rostral process to inner angle of wrist of pectoral; snout acute, with long pointed process, 5.7 in head, 11 in body; eye wholly lateral, 7.4 in head; interorbital 9.15; mouth rather broad, mostly transverse; maxillary 6.7 in head; teeth small, villiform, in bands on jaws, vomer and palatines; gill-opening small, situated at inner angle of base of pectoral; skin with bony protuberances, varying in size, smallest on belly where skin is shagreen-like, largest on back of tail; ventral surface of tail with bony plates; a large depression, longer than broad, under rostrum, this depression provided with a dermal tentacle which has a stock-like base and a more or less definite triangular expansion at tip; dorsal fin small, its origin at vertical from posterior margin of wrist of pectoral; caudal fin round; anal fin small, its origin about equidistant from vertical of origin of dorsal and base of caudal; ventral fins rather long and narrow, inserted about midway between mouth and vent; pectoral fins with distinct wrist, inserted on posterior margin of the disk-like head, the fin without wrist, 2.2 in head.

Color very dark brown above, somewhat lighter brown below; a black area on snout below rostral process and two black areas over disk at shoulders; the distal part of the spiny processes on body paler than the ground color; a series of short dermal flaps on upper jaw and on lower margin of disk pale; dorsal, caudal and anal and pectorals very dark brown to nearly black; the caudal with a greenish yellow cross-bar on middle of fin; ventral fins greenish.

A single specimen of this odd fish, 135 mm. in length, was taken. It appears to be a rare species.

Reported from North Carolina, the Florida Keys, the West Indies and from Ceara, Brazil. Our specimen was taken with a seine on a shallow beach at Porto Bello.

291. Genus **Zalieutes** Jordan & Evermann.

Zalieutes Jordan & Evermann, Rept. U. S. Fish Comm., XXI, 1895 (1896), 511 (type *Malthe elater* Jordan & Gilbert).

This genus appears to be very closely related to *Ogcocephalus,* but the head is said to be more broadly expanded, the disk being broader than long and about half as long as the total length of the fish. A single species is known.

757. Zalieutes elater (Jordan & Gilbert).

Malthe elater Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881, 365 (Mazatlan).

Ogcocephalus elater Jordan, Proc. Cal. Ac. Sci., 2nd Ser., V, 1895, 506.

Zalieutes elater Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2738; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 204.

Body depressed; the head very broad, disk-shaped, considerably broader than long, its width 1.4 in the body; the head and back considerably raised above the disk; greatest depth of body scarcely greater than width of mouth; snout short, scarcely projecting beyond mouth, its length about equal to interorbital width; eye rather large, longer than snout and wider than interorbital; mouth small, its width one-half greater than diameter of orbit; skin covered with comparatively rough, slender spines, those on snout, middle of back and tail largest; belly rough; under side of tail with tubercular plates; caudal fin a little longer than pectoral, about 4.3 in body; pectoral fins one-third longer than ventrals, 1.6 the width of mouth, and a little shorter than caudal.

Color light olive; upper parts everywhere thickly and uniformly covered with small round spots of dark brown about as large as pupil; a distinct ocellus, larger than eye, on each side of back, this ocellus with a bright green spot in center, surrounded by a black ring around which is a pale ring, and finally a fainter dark one; under parts plain white; caudal yellowish at base, with a terminal blackish band; pectorals spotted.

This species was not seen by us. The above description is compiled from published accounts. The Panama records are based on specimens taken by the Albatross at Stations 2794 and 2795. It is said to frequent waters of moderate depth, but to be very rare near the shore.

Known from Mazatlan to Panama.

INDEX TO PARTS I-III

Bold-faced type denotes names adopted in this work.

abbreviatus, Nauclerus........ 400
abildgaardi, Sparisoma. 748
abildgaardi, Sparus.........747,748
Ablennes.................. 231
abnormis, Ilisha.............. 189
Aboma..................... 887
Abudefduf.................. 700
Acanthias.................... 64
acanthias, Squalus...........64,65
Acanthinion.................. 377
acanthistius, Bodianus......... 440
acanthistius, Cephalopholis..... 440
Acanthochætodon............. 777
Acanthocybium.............. 326
Acanthopteri 262
Acanthorhinus................ 64
Acanthostracion.............. 805
Acanthuridæ................. 780
Acanthurus................. 781
acclivis, Larimus............. 687
Acedia......................1004
acervum, Cybium............. 323
Achirus.................... 994
achirus, Pleuronectes.......... 994
acoupa, Cheilodipterus......... 653
acoupa, Cynoscion............ 656
aculeatus, Doryichthys........ 261
acuminatus, Eques........... 677
acuminatus, Grammistes.....676,677
acus, Gymnotus............... 963
acus, Syngnathus............. 256
acuta, Myliobatis............. 91
acuta, Ophisoma.............. 138
acutirostris, Corvina........633,634
acutirostris, Lutjanus.......... 509
acutirostris, Pristis............ 67
acutirostris, Serranus.......... 445
acutus, Exocœtus............. 243
acutus, Fodiator............... 243
adscensionis, Epinephelus...... 456
adscensionis, Trachinus........ 456
adspersus, Paralichthys........ 974
adusta, Sciæna................ 639
adustus, Ophioscion........... 639
adustus, Pseudojulis........... 725
Ælurichthys.................. 96
æquidens, Otolithus........... 653
æthalion, Citharichthys........ 981
æthalorus, Carcharias.......... 41
Aëtobatus.................. 88
afer, Alphestes................ 463
afer, Epinephelus............. 463
affinis, Auchenopterus........ 930
affinis, Centropomus,.......... 433
affinis, Cremnobates........... 930
affinis, Elops................. 176
affinis, Fierasfer.............. 963
affinis, Isopisthus............. 650
affinis, Microdesmus.......... 955
affinis, Thynnus.............. 311
africana, Clupea.............. 189
afrum, Plectropoma........... 464
Agnus....................... 907
aguaji, Trisotropis............ 447
Ailurichthys.................. 96
alalunga, Germo.............. 316
alalunga, Scomber..........315,316
alatunga, Scomber............ 316
alatus, Arius................. 101
albacauda, Echeneis........... 896
Albacora.................... 314
albacora, Thynnus............ 316
albacores, Scomber............ 314
albescens, Echeneis.........897,898
albescens, Remora............ 898
albidus, Osmerus.............. 220
albifasciatus, Pomacentrus..... 697
albirostris, Prionotus.......... 858
albomaculatus, Serranus....... 466
Albula...................... 177
albula, Mugil................. 275
Albulidæ..................... 177
album, Hæmulon............. 540
alburnus, Perca............... 666
albus, Cynoscion.............. 665
albus, Otolithus............... 665
Alectis...................... 363
alepidotum, Gobiosoma........ 891
alepidotus, Chætodon.......... 410
alepidotus, Stromateus......... 411
Alexurus..................... 864
aliciolus, Trachurus........... 397
alletterata, Gymnosarda........ 311
alletteratus, Scomber.......... 311
alliteratus, Orcynus........... 311
Alopecias.................... 62
Alopias...................... 62
Alphestes................... 463
Alpismaris................... 215
altavela, Raia................ 86
alternans, Scarus............. 741
alticus, Salarias............... 948
altipinnis, Microdonophis...... 153
altipinnis, Micropogon......... 617
altivelis, Serranus............ 452
altus, Centropomus........... 433
altus, Chorinemus............. 388
altus, Oligoplites............. 388

aluta, Sciæna ... 630
Alutera ... 801
amarilla, Guativere ... 438
Amblypomacentrus ... 697
amblyrhynchus, Caranx ... 341
amblyrhynchus, Hemicaranx ... 341
Amblyscion ... 683
americana, Manta ... 94
americanus, Balistes ... 795
americanus, Cyprinus ... 666
americanus, Eques ... 676
americanus, Polynemus ... 289
Amia ... 414
ammocryptus, Tetraodon ... 817
Ammopleurops ... 1004
Amorphocephalus ... 729
Amphichthys ... 918
Amphioxi ... 27
Amphioxus ... 27
amplexicollis, Sarothrodus ... 771
amplus, Scarus ... 748
analigutta, Pomacentrus ... 698
analis, Caranx ... 349
analis, Lutianus ... 501
analis, Mesoprion ... 501
analis, Scyris ... 364
analis, Umbrina ... 615
analogus, Abudefduf ... 703
analogus, Epinephelus ... 454
analogus, Euschistodus ... 703
analogus, Kyphosus ... 605
analogus, Pimelepterus ... 605
Anchisomus ... 812
Anchovia ... 196
anchovia, Sardinella ... 183
Anchovies ... 195
Ancylodon ... 646
ancylodon, Ancylodon ... 648
ancylodon, Lonchurus ... 646, 647
ancylodon, Macrodon ... 647
Ancylopsetta ... 971
andrei, Gobius ... 867
Angelichthys ... 765
Anguilla ... 134
Anguillidæ ... 134
angulosus, Balistes ... 793, 794
angusticeps, Sphœroides ... 820
angusticeps, Tetrodon ... 820
angustifrons, Serranus ... 461
Anisotremus ... 560
anna-carolina, Mugilomorus ... 175
annularis, Holacanthus ... 777
annularis, Nauclerus ... 400
annularis, Sparus ... 580
annulatus, Sphœroides ... 816
annulatus, Tetrodon ... 816
anolis, Saurus ... 217
anoplos, Uranoscopus ... 907
antecessor, Gasterosteus ... 400
Antennariidæ ... 1009
Antennarius ... 1011
antennatus, Chilomycterus ... 832
antennatus, Diodon ... 832
antillanus, Conodon ... 521
antillarum, Caranx ... 350
Aphoristia ... 1004
apia, Pirati ... 446
apiarius, Serranus ... 441
apicalis, Echeneis ... 895
Apionichthys ... 1003
apoda, Perca ... 509
apoda, Pleuronectes ... 1002
Apodes ... 134
apodus, Lutianus ... 509
Apogon ... 414
Apogonidæ ... 414
appendiculatus, Centropomus ... 425
approximans, Polynemus ... 290
approximans, Pomadasys ... 556
aprion, Gerres ... 589
Apseudobranchus ... 653
apua, Bodianus ... 446
apua, Epinephelus ... 461
apua, Mycteroperca venenosa ... 446
aquadulce, Galeichthys ... 124
aquæ-dulcis, Muræna ... 161
aquila, Raja ... 90
aracanga, Scarus ... 759
aræa, Atherina ... 264
Aramaca ... 980
aramaca, Hemirhombus ... 981
aramaca, Pleuronectes ... 983
arangoi, Chœrojulis ... 718
arara, Hæmulon ... 532
arara, Serranus ... 447, 461
aratus, Lutianus ... 496
aratus, Mesoprion ... 493, 496
Arbaciosa ... 926
archidium, Elattarchus ... 628
archidium, Odontoscion ... 628
Archosargus ... 577
arcticus, Galeocerdo ... 56
arcticus, Squalus ... 56
arcuata, Harengula ... 184
arcuatum, Hæmulon ... 532
arcuatus, Chætodon ... 772, 773
arcuatus, Pomacanthus ... 773, 775
arenaceus, Citharichthys ... 985
arenata, Umbrina ... 670
arenatus, Priacanthus ... 487
arenatus, Rypticus ... 480
arenicola, Anchovia ... 201
argentata, Ilisha ... 190
argentea, Sciæna ... 547
argentea, Selene ... 371, 372
argenteus, Amblyscion ... 683, 684
argenteus, Centronotus ... 390
argenteus, Centropomus ... 425
argenteus, Diplodus ... 580
argenteus, Eucinostomus ... 582
argenteus, Larimus ... 684
argenteus, Micropogon ... 618
argenteus, Pristigaster ... 192
argenteus, Sargus ... 580

argenteus, Sparus 576
argenteus, Trachinotus 385
argenteus, Trichiurus 328
argentiventris, Lutianus 513
argentiventris, Mesoprion 513
argenti-vittatus, Thynnus 316
argus, Cephalopholis 438
argus, Squalus 29
Argyrea 266
Argyreiosus 371
argyroleucus, Bodianus 629
aries, Archosargus 579
aries, Sargus 579
arioides, Bagrus 123
ariommus, Aprion 517
Ariosoma 138
Arius 122
armata, Bairdiella 633,634
armata, Sciæna 361
armatus, Centropomus 430,431
armiger, Alexurus 864
armiger, Erotelis 864
arundelii, Gobius 868
ascensionis, Caranx 352
ascensionis, Holocentrus 297
ascensionis, Perca 297
ascensionis, Scomber 352
asperrimus, Myliobatis 91,92
asperrimus, Pteromylæus 92
aspersus, Prionotus 856
aspersus, Serranus 457
aspidurus, Urolophus 85
aspidurus, Urotrygon 85
Aspisurus 781
asterias, Blennius 941
asterias, Urotrygon 83
Asterospondyli 29
Atherina 263
Atherinella 265
Atherinidæ 262
Athlennes 231
atinga, Diodon 827
atlantica, Elacate 404
atlanticus, Epinephelus 457
atlanticus, Megalops 173,174
atlanticus, Rupiscartes 948
atlanticus, Salarias 948
atlanticus, Sparus 457
atlanticus, Tarpon 174
atlanticus, Thynnus 316
Atractoperca 466
Atractoscion 653
atramentatus, Symphurus 1008
atricauda, Aphoristia 1009
atricaudus, Symphurus 1009
atridorsalis, Centropomus 431
atrilobatus, Chromis 696
atrimanus, Caranx 342
atrimanus, Hemicaranx 342
atripinnis, Asthenurus 969
Atroscopus 907
atwoodi, Carcharias 63
aubrieti, Lutjanus 505
Auchenopterus 930
auctorum, Lobotes 484,485
auliscus, Siphostoma 260
aurantiacus, Balistes 801,802
auratus, Diapterus 591
auratus, Holocentrus 439
auratus, Serranus 439
aureolus, Diapterus 594
aureolus, Gerres 594
aureoruber, Sparus 748
aureoviridis, Sphyræna 425
aureus, Caranx 354
aureus, Chætodon 773
auriculata, Mobula 93
auriga, Chætodon 765
auriga, Monacanthus 798
aurita, Sardinella 181
aurolineatus, Diabasis 523
aurorubens, Centropristes 517
aurorubens, Rhomboplites 517
aurovittatus, Mesoprion 515
Auxis 312
averruncus, Kathetostoma 909
axillaris, Diapterus 599
axillaris, Gerres 599
aya, Bodianus 507
aya, Lutianus 507
ayresi, Centropristis 475
Ayresia 695
Azevia 990
azureus, Balistes 794
azureus, Carcharias 38
azureus, Scarus 742
azurissimus, Microspathodon 705

bacalaus. Gobius 878
badius, Euctenogobius 874
bahamensis, Vulpes 178
bahianus, Acanthurus 783
bahianus, Rhombus 979
bahiensis, Arius 96
bahiensis, Cypselurus 247
bahiensis, Exocœtus 247
baillonii, Cæsiomorus 377
Baiostoma 994
Bairdiella 629
balantiophthalmus, Scomber 335
balao, Hemirhamphus 235
balearica, Ariosoma 139
balearica, Muræna 138,139
Balistes 787
Balistidæ 787
balteatus, Pomacanthus 773
balteatus, Thynnus 316
balteatus, Upeneus 306
banana, Butyrinus 277
bancrofti, Torpedo 73
banksi, Citula 349
barbatus, Opsanus 917
barracuda, Esox 283
barracuda, Sphyræna 283

Barracudas 282
barreto, Gobioides 894
bartholomæi, Caranx 351
Bascanichthys 151
bascanium, Cœcula 151
batabanus, Johnius 691
Bat-fishes 1016
Bathygobius 867
bathymaster, Bregmaceros 969
Bathystoma 523
batis, Raja 71
Batoidei 65
Batrachoides 911
Batrachoididæ 910
Batrachus 911
Batrichtius 911
bayanus, Pomadasis 557
bayanus, Pomadasys 557
beani, Caranx 352
beani, Kirtlandia 270
becuna, Sphyræna 284
bellus, Balistes 792
Belonidæ 223
bengalensis, Ophisternon 131
berlandieri, Mugil 275
bermudensis, Lefroyia 963
Bibronia 1004
bicaudalis, Lactophrys 806
bicaudalis, Ostracion 805,806
bicolor, Anisotremus 565
bicolor, Pristipoma 565
bicolor, Smecticus 479
bifasciatus, Labrus 726
bifasciatus, Mullus 303
Big-eyes 486
bigibbus, Kyphosus 605
bilineatum, Pristipoma 560,566
bimaculatus, Chætodon 771
bimaculatus, Halichœres 714
binotata, Amia 416
binotatus, Apogon 416
bipinnulata, Seriola 393
bipinnulatus, Elagatis 393
birostratus, Prionotus 850,855
birostris, Manta 94
birostris, Raja 94
bispinosus, Myliobatis 91
bisus, Scomber 313
bitæniatus, Eumycterias 825
bivittata, Elacate 404
bivittatus, Labrus 717
bivittatus, Serranus 472,475
bixanthopterus, Caranx 353
blackfordii, Lutjanus 507
Blennidæ 928
Blennies 928
Blennius 940
Blepharichthys 363
Blepharis 363
blepharis, Carangoides 364
blochii, Bodianus 711
blochii, Caranx 357
Bluefishes 401
Bodianus 710
bodianus, Bodianus 710,711
boleosoma,Gobionellus 885
boleosoma, Gobius 885
bollmani, Hippoglossina 973
Bollmannia 885
bonaci, Mycteroperca 447
bonaci, Serranus 447
bonaparti, Pœcilocephalus 153
bonariense, Hæmulon 541
bonariensis, Seriola 396
Bonefish or Ladyfish 177
boops, Caranx 335
boops, Trachurus 359
borealis, Sphyræna 286
boscii, Pimelepterus 608
boscii, Seriola 396
bosquii, Pimelepterus 605,608
Bothrolæmus 377
boucardi, Pristipoma 559
boulengeri, Batrachoides 916
boulengeri, Mycteroperca 448
brachialis, Baiostoma 994,999
branchiatus, Diodon 827
Branchiostomidæ 27
brachycentrus, Nauclerus 400
brachychirus, Trachurops 335
Brachygenys 527
Brachypomacentrus 697
brachyptera, Echeneis 899
brachyptera, Remora 899
brachypterus, Echeneis 897
brachypterus, Exocœtus 244
brachypterus, Parexocœtus 244
brachypterus, Thynnus 314
Brachyrhinus 436
brachysomus, Calamus 574
brachysomus, Sparus 574
brachyurus, Ophichthys 159
brama, Cynædus 578
Branchiostoma 27
brandtii, Arius 103
branickii, Pomadasys 555
branickii, Pristipoma 555
brasilianus, Diapterus 600
brasilianus, Gerres 600
brasiliense, Pristipoma 565
brasiliensis, Amblyopus 894
brasiliensis, Clupea 178
brasiliensis, Esox 233,234
brasiliensis, Genyanemus 675
brasiliensis, Hemirhamphus 234,235
brasiliensis, Labrus 717
brasiliensis, Mugil 274,276,279
brasiliensis, Narcine 73
brasiliensis, Narinari 89
brasiliensis, Paralonchurus 675
brasiliensis, Plagusia 1005
brasiliensis, Scorpæna 837
brasiliensis, Thynnus 311
brasiliensis, Torpedo 72,73

brasiliensis, Vomer 366
Bregmaceros 969
Bregmacerotidæ 968
brevibarbe, Lepophidium 961
brevibarbe, Ophidion 961
Breviceps 96
breviceps, Evorthodus 869,870
breviceps, Larimus 683,686
breviceps, Pomacentrus 697
brevimanus, Diapterus 602
brevimanus, Gerres 602
brevipinne, Pristipoma 544,546
brevipinnis, Blennius 946
brevipinnis, Hypsoblennius 946
brevipinnis, Orthopristis 546
brevipinnis, Thynnus 311
brevirostra, Anchovia 198
brevirostris, Gerres 597
brevirostris, Hypoprion 50
brevirostris, Macrognathus 234
brevirostris, Saurus 223
brevirostrum, Hæmulon 542
brevis, Acanthurus 782
brevis, Amblyopus 869
brevis, Centropomus 431
brevis, Engraulis 214
brevis, Tyntlastes 869
brevoortii, Argyriosus 374
brevoortii, Selene 374
bricci, Chætodon 767
broccus, Balistes 797
Brotulidæ 965
broussonetii, Acanthurus 782
broussonetii, Gobioides 894
broussonetii, Gobius 894
broussonetii, Umbrina 613
brownii, Anchovia 204
brownii, Atherinia 204
brownii, Hemirhamphus 234
brownii, Solea 1002
brownii, Vomer 365,366
brunneus, Ectenias 405
brunneus, Serranus 447
bufo, Scorpæna 835
Butterfly-fishes 764
Butyrinus 177

caballa, Cybium 322
caballerote, Anthias 511
caballus, Caranx 359
caboverdianus, Ginglymostoma 30
Cæsiomorus 377
cæsius, Anisotremus 562
cæsius, Pomadasys 562
Calamus 572
calamus, Calamus 575
calamus, Chrysophrys 574
calamus, Pagellus 572,575
californicus, Hippoglossus 974
californiense, Branchiostoma 28
californiensis, Diapterus 584
californiensis, Eucinostomus 584
californiensis, Ophisurus 155
californiensis, Polynemus 291
Calliodon 733,735
callisoma, Herpetoichthys 155
callopis, Harengula 183
callopterus, Cypselurus 246
callopterus, Exocœtus 246
calopteryx, Serranus 470
campechanus, Mesoprion 507
canadus, Gasterosteus 403
canadus, Rachycentron 403
cancrivorus, Pisodonophis 147
caninus, Caranx 350
canis, Squalus 31,34
canna, Hæmulon 539,540
Cannorhynchus 248
cantharinum, Pristipoma 544
Cantherines 800
Canthidermis 793
Canthigaster 825
cantraini, Tylosurus 224
capensis, Carcharodon 63
capensis, Elops 175
capeuna, Serranus 524
capillaris, Zeus 372
capillatus, Clinus 936
capistratus, Balistes 787,788
capistratus, Chætodon 765,767
capistratus, Pachynathus 788
caprinus, Balistes 792
Capriscus 787
capriscus, Balistes 787,791
caramura, Murenophis 166
Carangidæ 331
Carangops 339
carangua, Caranx 350
Carangus 346
carangus, Scomber 346,350
Caranx 346
Caranxomorus 405
Carapidæ 962
Carapus 963
carauna, Serranus 439
carbonarium, Hæmulon 537
Carcharhinidæ 35
Carcharhinus 36
Carcharias 36
carcharias, Carcharodon 63
carcharias, Squalus 36,63
Carcharodon 63
cardenal, Bonaci 446
Cardinal-fishes 414
cardinalis, Serranus 446
Carenchelyi 132
caribæum, Branchiostoma 28
caribæus, Sargus 578
caribbæa, Ilisha 191
caribbæus, Chloroscombrus 369
caribbæus, Scorpænodes 847
carneus, Acronurus 785
carolina, Argentia 175
carolinensis, Balistes 791

carolinensis, Cestreus 653
caroliniensis, Gobius 867
carolinus, Doliodon 379
carolinus, Gasterosteus 377, 385
carolinus, Priacanthus 488
carolinus, Trachinotus 385
catalufa, Priacanthus 487
catenata, Echidna 171
catenatus, Gymnothorax 170, 171
Catfishes 95
Cathorops 129
Catochænum 591
catulus, Gobius 867
catus, Serranus 461
caudata, Lamna 38
caudimacula, Hæmulon 537, 539
caudimacula, Sargus 580
caulopus, Homesthes 947, 948
cavalla, Cybium 322
cavalla, Scomberomorus 322
Cavallas 331
caxis, Sparus 509
cayennensis, Citharichthys 985
cayennensis, Otolithus 665
cayennensis, Vomer 366
cayorum, Ogilbia 965, 967
Centengraulis 212
Centronotus 399
Centropomidæ 419
Centropomus 419
Centropyge 777
Centrurophis 153
cepedianus, Priacanthus 488
Cephacandia 859
Cephalacanthidæ 859
Cephalacanthus 859
Cephalopholis 438
cephalus, Gobiesox 925
cephalus, Mugil 273, 275
cerapalus, Opsanus 917
Ceratacanthus 801
Cerdale 958
cerdale, Carcharhinus 47
Cerdalidæ 954
Cerna 452
ceruleus, Carcharias 38
Cestracion 57
Cestraciontidæ 57
Cestreus 653
Cetengraulis 212
Chænomugil 281
Chænopsetta 974
Chætodipterus 760
Chætodon 765
Chætodontidæ 764
chagresi, Menidia 266
chalceum, Pristipoma 545
chalceus, Orthopristis 545
chalinius, Epinephelus 445
Chalisoma 787
chamensis, Ophichthus 155
Chapinus 805
Cheilodipteridæ 414
Cheilotrema 679
Chelichthys 811
cherna, Anthias 460
chevola, Gallichtys 364
chilensis, Pelamys 318
chilensis, Sarda 318
chilensis, Tomicodon 926
Chilomycterus 831
chinensis, Balistes 796
Chironectes 1012
chirurgus, Chætodon 784
chlamydes, Bollmannia 885, 886
Chlorichthys 726
chloris, Pseudoscarus 740
chloris, Scarus 753
chloris, Scomber 369
chloropterum, Plectropoma 463, 464
Chloroscombrus 369
Chlorurus 736
Chœrojulis 714
Chriolax 848
Chriomitra 321
Chromis 694
chromis, Diabasis 539
chromis, Hæmulon 539
chromis, Sparus 694
chrysargyreus, Brachygenys 527
chrysargyreus, Hæmulon 527
chryseus, Rhinoberyx 294
chrysoleuca, Bairdiella 630
chrysoleuca, Corvina 630
chrysomelanus, Sparus 460
chrysops, Ophisurus 159
chrysoptera, Perca 544
chrysopteron, Hæmulon 523
chrysopterum, Sparisoma 753
chrysopterus, Cheilodipterus 521
chrysopterus, Scarus 753
chrysos, Carangus 350
chrysurus, Chloroscombrus 369
chrysurus, Dipterodon 629
chrysurus, Glypisodon 705, 706
chrysurus, Microspathodon 706
chrysurus, Ocyurus 515
chrysurus, Scomber 369
chrysurus, Sparus 515
cibi, Caranx 351
ciliaris, Alectis 364
ciliaris, Angelichthys 765
ciliaris, Balistes 793
ciliaris, Zeus 363, 364
ciliatus, Balistes 799
ciliatus, Monacanthus 799
cinereus, Gerres 589
cinereus, Gerres californiensis 584
cinereus, Microspathodon 705
cinereus, Mugil 589
cingulatus, Pomacanthus 773
cirratum, Ginglymostoma 29
cirratus, Squalus 29
Cirrhisomus 811

cirrhosa, Sciæna 613
cirrhosum, Lepisoma 935
Citharichthys 985
Citharœdus 765
Citula 361
clarionis, Xesurus 786
clathratus, Labrax 466
clepsydra, Muræna 169
clepsydralis, Julis 728
Cling-fishes 925
Clupanodon 180
Clupeidæ 179
clupeola, Harengula 183
coccineus, Scarus 748
Cœcilophis 153
cœrulea, Corphyæna 739
cœruleatus, Acronurus 782
cœruleoaureus, Harpe 710,711
cœruleus, Acanthurus 782
cœruleus, Cyanichthys 831
cœruleus, Scarus 739
Cogrus 153
Cokeridia 905
colias, Scomber 309
Colloptilum 969
colonensis, Scorpæna 844
colonensis, Stellifer 623
colonus, Serranus 437
colorado, Lutianus 500
colorado, Lutjanus 500
colorado, Perro 711
columbianus, Vomer 366
comifer, Achirus 999
commersonianus, Lophius 1011,1012
commersonii, Carcharhinus 43
commersonii, Fistularia 253
commersonii, Scomber 321
commersonii, Squalus 36
compar, Cœcilophis 153
compressus, Nauclerus 399,400
compressus, Odontognathus 194
concatenatus, Ostracion 805
concolor, Abudefduf 703
concolor, Chriomitra 321,325
concolor, Euschistodus 704
concolor, Nexilarius 704
concolor, Scomberomorus 325
concolor, Thyrsoidea 163
conductor, Centronotus 399,400
Conger Eels 135
conger, Leptocephalus 137
conger, Muræna 137
Congermuræna 138
Congrellus 138
coniceps, Murænesox 142
Conodon 521
conorhynchus, Albula 177,178
conspersus, Serranus 458
constantinus, Centropomus 423
constellatus, Platophrys 978
corallina, Narcine 73
Cordylus 308
coretta, Thynnus 315
coriaceus, Eleutheractis 479
corneta, Fistularia 249
Cornet-fishes 248
cornutus, Cyclichthys 833
coro, Sciæna 521
coroides, Umbrina 613
coronata, Seriola 396
coronatus, Halatractus 396
coronatus, Serranus 441
corvinæforme, Hæmulon 549
corvinæformis, Pomadasys 549
Corvula 691
Coryphæna 405
Coryphænidæ 405
cosmopolita, Micropteryx 369
cosmopolita, Seriola 369
Cossyphus 710
costalesi, Smaragdus 881
courtadei, Serranus 454
crassa, Belone 226
crebripunctata, Pteroplatea 87
Cremnobates 930
crenulatus, Peprilus 410
creolus, Serranus 436,437
crescentalis, Pomacanthus 776
crestonis, Acanthurus 782
crestonis, Teuthis 782
cretenses, Labrus 747
crinitus, Blennius 941
crinitus, Zeus 363,364
cristagalli, Gobius 866
cristatus, Blennius 941
Croakers 610
crocro, Pomadasis 556, 559
crocro, Pomadasys 559
crocro, Pristipoma 559
croicensis, Labrus 736
croicensis, Scarus 741
Cromileptes 452
crossota, Cokeridia 905,906
crossotus, Etropus 992
crotaphus, Julis 717,720
cruentatus, Labrus 488
cruentatus, Petrometopon 441
cruentatus, Priacanthus 488
cruentatus, Sparus 441
cruentifer, Pisodonophis 149
cruentifer, Pisoodonophis 149
crumenophthalmus, Scomber 335
crumenophthalmus, Selar 335
cryptocentrus, Amphichthys 918
cryptocentrus, Batrachus 918
Cryptoterus 154
Cryptotomus 733
crysos, Caranx 358
crysos, Scomber 346,358
cubæ, Vomer 366
cubanus, Epinephelus 461
cubera, Lutjanus 499
cucuri, Prionodon 41
cultifrons, Aluterus 802

cultratus, Xyrichthys.......... 729
cultriferum, Pristipoma........ 559
culveri, Trachinotus........... 381
cupreus, Trachinotus.......... 385
curema, Mugil................ 279
curta, Anchovia............... 206
curtus, Stolephorus............ 206
curtus, Vomer................ 366
curvilineata, Murenophis....... 166
curvus, Tetrodon............. 811
Cusk Eels.................... 959
cuspicauda, Aluteres........... 802
Cutlass-fishes................. 327
cuvieri, Caranx............... 338
cuvieri, Centropomus.......... 421
cyanellus, Mugilops........... 271
Cyanichthys.................. 831
cyanocephalus, Halichœres..... 716
cyanocephalus, Labrus......... 716
cyanolene, Sparisoma.......... 751
cyanophrys, Naucrates........ 400
cyanophrys, Psenes............ 409
cyanopterus, Cypselurus....... 247
cyanopterus, Exocœtus........ 247
cyanopterus, Lutianus......... 499
cyanopterus, Mesoprion........ 499
cyanostigma, Julis............ 717
cyanostigma, Pristotis......... 697
Cybium...................... 321
Cyclichthys.................. 831
cyclolepis, Microgobius........ 872
Cyclonarce................... 72
cyclopomatus, Serranus........ 447
Cyclopsetta.................. 991
Cyclospondyli................ 64
cylindricus, Bascanichthys..... 152
Cynias...................... 31
Cynichthys.................. 452
cynodon, Mesoprion.........499,509
Cynoscion.................... 653
cyprinaceous, Chætodon....... 608
cyprinoides, Gobius........... 866
cyprinoides, Lophogobius...... 866
Cypselurus.................. 245

Dactylagnus.................. 904
Dactylopterus................ 859
Dactyloscopidæ............... 902
Dactyloscopus............... 902
Dæctor...................... 919
daspilotus, Pisodonophis....... 148
daspilotus, Pisoodonophis...... 148
Dasyatis..................... 76
Dasybatidæ.................. 75
Dasybatus.................. 75
dasycephalus, Arius........... 106
dasycephalus, Galeichthys..... 106
daubentonnii, Caranx.......... 350
davidsonii, Monacanthus....... 799
Decapterus.................. 333
Decaptus.................... 393
decimalis, Serranus........... 447
declivifrons, Abudefduf........ 701
declivifrons, Euschistodus...... 700
declivifrons, Vomer........... 367
declivis, Trachurus............ 337
decoratus, Promicropterus...... 482
decoris, Doratonotus.......... 731
defensor, Caranx............. 350
dekayi, Scomber.............. 309
delalandii, Clinus............. 938
delalandii, Malacoctenus....... 938
deliciosa, Corvina............. 679
deliciosa, Sciæna............. 679
dendritica, Ancylopsetta.....971,972
dendritica, Pseudorhombus..... 972
denegatus, Pomacentrus....... 706
dentatus, Lutjanus............ 499
dentex, Corvina.............. 688
dentex, Odontoscion.......... 688
dentex, Scomber.............. 349
dephilippii, Vexillifer.......... 963
depressa, Belone.............. 229
depressa, Fistularia........... 251
Derichthyidæ................ 132
Desmoiselles................. 693
diadema, Scarus.............. 737
Dialommus.................. 934
Diaphasia.................... 963
Diapterus................... 591
diego, Scomber............... 309
dimidiatus, Julis.............. 716
Diodon...................... 826
Diodontidæ.................. 826
Diplectrum.................. 472
Diplodus.................... 580
diplotænia, Bodianus.......... 712
diplotænia, Harpe............. 712
Dipterodon.................. 414
dipus, Microdesmus.........954,956
Discopyge.................... 74
dispilus, Halichœres.......... 721
dispilus, Platyglossus.......... 721
distinctum, Sparisoma......... 749
distinctus, Scarus............. 749
Dog-fishes................... 64
dolfyn, Coryphæna............ 406
doliata, Gymnomuræna........ 170
Doliodon.................... 377
Dolphins.................... 405
dominicensis, Vomer.......... 366
dorado, Coryphæna........... 406
Doratonotus................. 730
dorsale, Hæmulon............. 536
dorsalis, Carangoides.......... 362
dorsalis, Citula.............. 362
dorsalis, Galeorhinus.......... 32
dorsalis, Halatractus.......... 398
dorsalis, Hypsypops........... 705
dorsalis, Microspathodon...... 705
dorsalis, Mustelus............. 32
dorsalis, Seriola............. 398
dorsalis, Umbrina............ 614
Dorsuarius.................. 605

Doryrhamphus 261
dovii, Anisotremus 563
dovii, Apogon 417
dovii, Arius 101
dovii, Gymnothorax 165
dovii, Muræna 165
dovii, Opisthopterus 192
dovii, Pristigaster 192
dovii, Pristipoma 563
dowi, Thalassophryne 919,920
dowii, Diapterus 584
dowii, Leptarius 101
dowii, Selenaspis 101
drummondii, Echiodon 963
dubius, Carapus 963
dubius, Fierasfer 963
dubius, Serranus 438
ductor, Gasterosteus 399
ductor, Naucrates 400
dumerili, Apionichthys 1003
dumerili, Caranx 394,397
dumerili, Polycirrhus 671,672
dumerili, Seriola 394,397
dumerilii, Paralonchurus 672
duperrey, Julis 728
duperrey, Thalassoma 728
duplex, Orthopristis 544
dussumieri, Seriola 400

Eagle Rays 88
Echeneididæ 895
Echeneis 896
Echidna 170
echidna, Muræna 170
echinus, Diodon 827
Echiodon 963
Ectenias 405
edentulus, Cetengraulis 214
edentulus, Engraulis 212,214
effulgens, Larimus 685
ehrenbergi, Carcharias 41
eigenmannia, Anchovia 205
eigenmanni, Galeichthys 108
ekala, Caranx 350
Elacate 403
Elagatis 393
Elapsopsis 153
Elasmobranchii 29
elater, Malthe 1018
elater, Zalieutes 1018
Elattarchus 628
elattura, Netuma 115
elatturus, Arius 115
elcapitanense, Siphostoma 260
elcapitanense, Syngnathus 260
Electric Rays 72
electricus, Rhinobatus 69
elegans, Hæmulon 529,534
elegans, Kyphosus 607
elegans, Mesoprion 517
elegans, Pimelepterus 607
Eleutheractis 479
elliotti, Diabolichthys 94
elongata, Alosa 189
elongata, Anchovia 198
elongata, Aphoristia 1006
elongata, Umbrina 667
elongatum, Sparisoma 757
elongatus, Eucinostomus calif. 586
elongatus, Megalops 174
elongatus, Menticirrhus 667
elongatus, Pomadasys 551
elongatus, Symphurus 1006
Elopidæ 173
Elops 175
emarginatus, Lobotes 493,511
Emblemaria 952
emblematicus, Gobius 871,872
emblematicus, Microgobius 872
embryx, Gerres 598
emmelane, Tachysurus 123
encæomus, Gobionellus 884
encæomus, Gobius 884
Enchelyopus 328
Engraulidæ 195
engymen, Cetengraulis 213
Engyophrys 975
Enneacentrus 438
ensifera, Bairdiella 632
ensifera, Sciæna 632
ensiferus, Centropomus 430,431,433
ensis, Sphyræna 285
entemedor, Narcine 74
Enypnias 887
Ephippidæ 760
ephippium, Chætodon 765
epicurorum, Chromis 402
Epinephelus 452
epsetus, Esox 204
equatorialis, Raja 71
Eques 676
equestris, Balistes 792
equestris, Mustelus 34
Equietus 676
erebus, Muræna 163
erethizon, Arothron 823
ericymba, Sciæna 627
ericymba, Stellifer 627
erithrurus, Caranx 350
Erotelis 864
erythrinoides, Scarus 748
erythrogaster, Serranus 455
esculentus, Carangus 350
Esloscopus 902
etheostoma, Aboma 887
Etropus 992
Eucinostomus 582
Euctenogobius 874
Eulamia 36
eumorphus, Chatœssus 187
Eumycterias 825
Eupomacentrus 697
europæus, Trachurus 337
euryplectrum, Diplectrum 474

Euscarus 747
Euschistodus 700
Eustomatodus 333
Evapristis 544
evermanni, Citharichthys 989
evermanni, Diapterus 594
evermanni, Synodus 219
evermanni, Tachysurus 126
Evermannia 891
evolans, Trigla 848
Evorthodus 869
excisus, Doryrhamphus 261
exigua, Anchovia 200
Exocœtidæ 241
Exocœtus 244
Exonautes 244
expansum, Ostracion 806
exsiliens, Exocœtus 244
Eyrchthys 736

faber, Chætodipterus 761
faber, Chætodon 761
falcatus, Caranx 341
falcatus, Scomber 377
falcatus, Sparus 711
falcatus, Trachinotus 378
falcipinnis, Carcharias 46
falcipinnis, Elacato 404
fallax, Caranx 354
fallax, Trachurus 338
fanfarus, Naucrates 399,400
fasciatum, Cheilotrema 679
fasciatus, Achirus 1001
fasciatus, Carcharias 56
fasciatus, Genyanemus 672
fasciatus, Hemirhamphus 237
fasciatus, Ovoides 823
fasciatus, Prionodes 470
fasciatus, Scomber 394
fasciatus, Trachynotus 383
fasciculare, Diplectrum 472
fascicularis, Hippocampus 255
fascicularis, Serranus 473
feliceps, Galeichthys 104
Felichthys 96
felis, Felichthys 99
felis, Silurus 99
fernandinus, Squalus 65
Fierasfer 963
Fierasferidæ 962
filamentosus, Argyriosus 373
filamentosus, Breviceps 96
filamentosus, Felichthys 96
filamentosus, Hemirhamphus 234
filamentosus, Monacanthus 797
filamentosus, Scomber 364
filicornis, Blennius 941
fimbriata, Raja 94
fimbriatus, Achirus 1001
fimbriatus, Hemirhombus 991
fimbriatus, Solea 1001
fischeri, Solea 996
Fistularia 248
Fistulariidæ 248
fistularis, Flagellaria 250
flava-purpurea, Perca 452
flavescens, Mesoprion 510
flavescens, Scarus 758
flavescens, Sparisoma 755,758
flavicauda, Hyporthodus 452,458
flaviguttatum, Lythrulon 528
flaviguttatus, Hæmulon 528
flavilatus, Pomacentrus 698
flavipinnis, Pristigaster 189
flavo-cæruleus, Holocentrus 452
flavofasciata, Echidna 172
flavolineatum, Hæmulon 531
flavolineatus, Diabasis 531
flavolineatus, Sargus 578
flavoscriptus, Gymnothorax 166
flavo-vittatis, Upeneus 306
fleurieu, Ostorhinchus 414
florealis, Platyglossus 718
Flounders 970
fluviatilis, Achirus 1002
Flying Fishes 241
Flying Gurnards 859
Fodiator 243
fodiator, Tylosurus 225
fœtens, Salmo 215,220
fœtens, Synodus 220
fonsecensis, Achirus 996
fonsecensis, Solea 996
forcipatus, Balistes 793
formosa, Guentheridia 822
formosa, Perca 472,473
formosum, Diplectrum 473
formosum, Hæmulon 532
formosus, Anthia 533
formosus, Serranus 473
formosus, Tetrodon 821,822
forskali, Glossodus 178
fosteri, Sphyræna 285
fremebundum, Hæmulon 535
freminvillii, Myliobatis 91
Frog-fishes 1009
frondosus, Scarus 759
frondosum, Sparisoma 759
frontalis, Caranx 352
fronto, Carcharias 38
fuerthii, Arius 126
fulgens, Corvina 632
fuliginosus, Balistes 792
fuliginosus, Synbranchus 131
fulvum, Ginglymostoma 30
fulvus, Cephalopholis 438
fulvus, Labrus 438
funebris, Gymnothorax 163
Furcaria 694
furcatus, Cypselurus 247
furcatus, Exocœtus 245,247
furcifer, Paranthias 436
furcifer, Serranus 436
furnieri, Micropogon 618

furnieri, Umbrina............ 618
fürthii, Arius.................. 125
fürthii, Caranx.............. 344
fürthii, Corvina.............. 622
fürthii, Ilisha.................. 189
fürthii, Pellona.............. 189
fürthii, Pristipoma........... 568
fürthii, Sphœroides........... 821
fürthii, Stellifer.............. 622
fürthii, Tetrodon............. 821
fusca, Echeneis............... 896
fuscomaculata, Echidna........ 172
fuscus, Acronurus............. 785
fuscus, Dialommus..........934,935
fuscus, Hemirhombus.......... 988
fuscus, Mapo.................. 868
fuscus, Pomacentrus.......... 699
fuscus, Trachinotus........... 379
fuscus, Xyster................ 605

gabbi, Centropomus........... 423
gaimardianus, Mugil.......... 279
Galeichthys.................. 104
Galeocerdo................... 56
Galeorhinidæ.................. 31
Galeorhinus.................. 31
galeus, Serranus.............. 450
Gallichthys................... 363
gallichthys, Carangoides....... 364
gallinula, Monacanthus........ 797
Gallus....................... 363
gallus, Zeus................363,372
gardenii, Centronotus.......... 404
gardenii, Stromateus.......... 411
garmani, Stolephorus.......... 214
Garmannia................... 889
Gastrophysus................. 809
Genicanthus.................. 777
gentilis, Blennius............. 942
Genytremus................... 560
geometricus, Anchisomus....... 816
geometricus, Diodon........... 833
geometricus, Tetrodon......... 817
geometricus, Zeus............. 373
gerania, Belone............... 226
Gerhardinus.................. 889
Germo....................... 315
germon, Scomber...........315,316
Gerres....................... 589
Gerridæ...................... 581
gibbosa, Perca............... 540
gibbosus, Calliodon........... 540
gibbosus, Holocentrus......... 566
gibbus, Histrio............... 1010
gibbus, Lophius.............. 1010
gibbus, Scarus............... 736
gigas, Ephippus.............. 761
gigas, Perca.................. 452
gigas, Seriola................ 397
gilberti, Batrachoides......... 914
gilberti, Citharichthys......... 987
gilberti, Congrellus........... 139
gilberti, Kirtlandia............ 268
gilberti, Menidia.............. 268
gilberti, Stolephorus........... 214
gilli, Hyporhamphus........... 240
gilli, Pomacentrus............. 698
Ginglymostoma................ 29
giorna, Cephaloptera.......... 94
girardi, Caranx............... 360
girardi, Pseudojulis........... 725
gladius, Tylosurus............ 226
glaucoides, Trachynotus....... 383
glaucus, Chætodon............ 382
glaucus, Squalus.............. 36
glaucus, Trachinotus.......... 382
Glossichthys................. 1004
Glossodus.................... 178
Glyphisodon.................. 700
Gnathanodon.................. 360
Gnathobolus.................. 193
Gnathypops................... 900
Gobies....................... 861
Gobiesocidæ.................. 925
Gobiesox..................... 925
Gobiidæ...................... 861
Gobioides.................... 894
Gobionellus.................. 876
Gobiosoma.................... 891
godeffroyi, Percichthys........ 466
goldmani, Batrachoides........ 913
gomesii, Ophichthus........... 159
gomesii, Ophisurus............ 159
Gonenion..................... 402
Gonionarce................... 72
Gonioperca................... 466
Gonocephalus................. 860
goodei, Myliobatis............ 90
goodei, Paralonchurus......... 673
goodei, Urolophus............. 84
goodei, Urotrygon............. 84
Gorgasia..................... 133
gracilis, Diapterus............ 584
gracilis, Hippocampus......... 256
gracilis, Scomber............. 309
gracilis, Umbrina............. 670
Grammateus.................. 572
Grammichthys................ 994
grandicassis, Arius............ 122
grandicornis, Scorpæna........ 838
grandis, Pomadasis............ 559
grandisquamis, Chœrojulis..... 718
grandisquamis, Upeneus....... 305
grandoculatus, Centropomus... 421
granulatus, Amorphocephalus... 729
granulosa, Pristis............. 66
greenei, Porichthys........... 924
grex, Scomber................ 309
grisea, Unibranchapertura...... 131
griseus, Labrus.............493,511
griseus, Lutianus............. 511
griseus, Mesoprion............ 500
gronovii, Gobius...........407,408
gronovii, Nomeus............. 408

gronovii, Ostracion 807
grossidens, Engraulis 211
Grunters 520
guacamaia, Pseudoscarus 744
guacamaia, Scarus 744
Guacamaya 744
guachancho, Sphyræna 285
guaguanche, Sphyræna 286
guanabana, Erizo 830
guara, Caranx 349
guara, Scomber 349
guasa, Serranus 450
guatemalensis, Arius 110
guatemalensis, Citharichthy 988
guatemalensis, Galeichthys 110
guativere, Bodianus 439
guaza, Labrus 452
Guentheridia 821
guineensis, Hemirhombus 980
guineensis, Ostracion 807
Guitar Fishes 67
gula, Eucinostomus 582
gula, Gerres 582
gulosus, Cathorops 130
gulosus, Tachisurus 130
gulula, Eucinostomus 582
Gunards 484
güntheri, Hoplopagrus 491,492
güntheri, Mugil 275,277
güntheri, Sphyræna 286
guttata, Limamuræna 168
guttata, Perca 450,461
guttatus, Balistes 793
guttatus, Dasybatus 78
guttatus, Enneacentrus 441
guttatus, Epinephelus 461
guttatus, Johnius 444,446
guttatus, Labrus 714
guttatus, Lutianus 503
guttatus, Mesoprion 503
guttatus, Promicrops 450
guttatus, Raja 78
guttulatus, Hippocampus 255
Gymneleotris 863
Gymnogaster 328
Gymnomuræna 170
Gymnosarda 310
Gymnothorax 161
gymnura, Trygon 78
gyrans, Querimana 676

Hæmulidæ 520
Hæmulon 529
Halatractus 394
Halichœres 714
Haliperca 472
halleri, Urobatis 86
halleri, Urolophus 86
hamiltoni, Brachioptilon 94
Hammer-headed Sharks 57
harengulus, Eucinostomus 584
harengus, Myxus 273,279
Harpe 710
harroweri, Isopisthus 650
Harvest-fishes 407
hastata, Pastinaca 80
hastatus, Dasybatus 80
hastatus, Gobionellus 876
havana, Gerres 590
havana, Xystæma 590
havannensis, Muræna 154
heckeli, Peloria 977
helena, Muræna 161,168
Heliases 694
Hemibranchii 248
Hemicaranx 339
hemiodon, Carcharias 50
Hemirhamphidæ 232
Hemirhamphus 233
Hemirhombus 980
Hemistoma 736
Hemiulis 714
henlei, Carcharias 49
hentz, Blennius 942
Hepatidæ 780
hepatus, Acanthurus 784
hepatus, Teuthis 784
hepsetus, Atherina 263
heptacanthus, Cheilodipterus 402
heraldi, Tetrodon 816
heringi, Centropomus 423
Herpetoichthys 153
Herrings 179
herzbergi, Silurus 101
heterodon, Hæmulon 531
heteropygus, Caranx 339,341
heterurus, Cypselurus 247
heterurus, Exocœtus 247
hexacanthus, Dipterodon 414
hians, Ablennis 231
hians, Belone 231
hians, Hæmulon 534
hildebrandi, Opsanus 917
hinnulus, Mustelus 34
Hippocampus 255
hippocampus, Syngnathus 255
Hippoglossina 973
hippos, Caranx 346,350,356
hippos, Scomber 334,350
hippuroides, Lepimphis 405
hippurus, Coryphæna 405,406
hispidus, Balistes 797
hispidus, Monacanthus 797
hispidus, Tetraodon 823
Histrio 1010
histrio, Lophius 1010
histrio, Scorpæna 840
hiulcus, Engraulis 204
Holacanthus 777
holacanthus, Diodon 829
holbroocki, Aluterus 802
Holocanthus 812
Holocenthrus 296
Holocentridæ 293

Holocentrus 296
holocyaneos, Sparus 740
homei, Oxybeles 963
Homesthes 947
homonymus, Diapterus 582
Homoprion 619
hopkinsi, Xesurus 786
hoplomystax, Scarus 751
Hoplopagrus 491
Hoplunnis 143
horrens, Prionotus 851,852
hospes, Mugil 279
humeralis, Chætodon 770
humeralis, Gobiesox 926
humeralis, Harengula 184
humeralis, Julis 717
humeralis, Paralabrax 466
humeralis, Serranus 466
humeri-maculatus, Sargus 578
humile, Pristipoma 557
humilis, Pagellus 572
Hypocaranx 360
hypophthalmus, Arius 129
hypophthalmus, Cathorops 129
Hypoplectrus 467
Hypoprion 50
Hypoprionodon 50
Hyporhamphus 236
Hyporthodus 452
Hyposerranus 452
hypostoma, Mobula 93
hypostomus, Cephalopterus 93
hypostomus, Mobula 93
Hypsoblennius 942
hystrix, Diodon 826,827

Ilisha 189
illecebrosus, Stellifer 625
imberbe, Ophidion 963
imiceps, Ophioscion 643
imiceps, Sciæna 643
immaculata, Amia 178
immaculata, Coryphæna 406
immaculata, Fistularia 253
immaculatum, Cybium 322
immaculatus, Synbranchus 131
imperialis, Esox 224
impetiginosus, Serranus 457
implutus, Tetrodon 823
impressus, Conger 139
incilis, Mugil 277,278
indefatigabile, Otophidium 961
indica, Narcine 72
indica, Scyris 363
indicus, Naucrates 400
inermis, Mesoprion 514
infernalis, Muræna 163
ingens, Hippocampus 256
Iniomi 215
inornatus, Oligoplites 391
insculpta, Netuma 116
insculptus, Arius 116
insolatus, Heliases 694
insulæ-sanctæ-crucis, Scarus 741
insularum, Carcharias 44
Insuridæ 63
intermedius, Hippoglossus 983
intermedius, Microdesmus 957
intermedius, Saurus 217
intermedius, Synodus 217,218
internasalis, Julis 716
interruptus, Anisotremus 568
interruptus, Genytremus 568
ionthas, Cerdale 958,959
iridinus, Caranx 357
Iridio 714
irradians, Serranus 473
irroratus, Monacanthus 800
Isaciella 544
ischana, Anchovia 201,203
ischanus, Stolephorus 203
Isesthes 942
Isogomphodon 36
isoodon, Mesoprion 501
Isopisthus 650
Isospondyli 173
isthmensis, Ælurichthys 97
isthmensis, Scorpæna 842
itaiara, Promicrops 450
itaiara, Serranus 450

jacobæa, Echeneis 898
jacobus, Myripristis 293,294
jaculidens, Ancylodon 647,648
jaguana, Harengula 184
jaguar, Bodianus 297
jamaicensis, Cynoscion 662
jamaicensis, Otolithus 662
januaria, Umbrina 670
Jaw-fishes 899
jeniguano, Hæmulon 523
jenkinsi, Synodus 221
jocu, Anthias 508
jocu, Lutianus 508
johnii, Ceratoptera 94
jonesii, Gerres 584
jordani, Galeichthys 109
jordani, Gymnothorax 167
jordani, Lutianus 495
jordani, Lycodontis 167
jordani, Neomænis 495
jordani, Tachisurus 109
juba, Perca 596
Julidio 725

Kathetostoma 909
kendalli, Sphœroides 819
kennedyi, Trachinotus 380
kessleri, Arius 119
kessleri, Netuma 119
kirschii, Halichœres 720
Kirtlandia 268
klunzingeri, Achirus 997
klunzingeri, Solea 997

knèri, Pristipoma 545
kœlreuteri, Scomber 400
kurra, Caranx 333
kurroides, Decapterus 333
Kyphosidæ 604
Kyphosus 605

labraciforme, Pristipoma 557
Labridæ 709
labridum, Hæmulon 566
labriformis, Epinephelus 459
labriformis, Serranus 452,959
Labrisomus 935
Labroperca 452
Labrosomus 936
Lacertinus, Synodus 220
lacertus, Gobius 867
lacertus, Scomber 309
lacrimosus, Scarus 751
lactea, Plagusia 1004
Lactophrys 804
lævigatus, Chironectes 1010
lævigatus, Lagocephalus 811
lævigatus, Tetraodon 811
lævis, Balistes 803
lævis, Galeorhinus 34
lævis, Galeus 34
lævis, Mustelus 31,34
lævis, Uranoscopus 909
Lagocephalus 809
lalandi, Seriola 397,398
lalandii, Carcharias 53
lalandii, Scoliodon 53
lamarckii, Holacanthus 777
lamia, Carcharias 36,43
lamiella, Carcharias 43
Lamiopsis 36
lamprurus, Hypoplectrus 468
lamprurus, Serranus 468
Lampugus 405
Lancelets 27
lanceolatus, Chætodon 676
lanceolatus, Gobius 878
lanceolatus, Homoprion 619
lanceolatus, Limax 27
Larimus 683
latepictus, Serranus 447
lateralis, Scarus 753
laterna, Tetrodon 823
laticaudus, Carcharias 51
laticeps, Aëtobatus 89
laticeps, Atherina 264
laticlavius, Xesurus 786
latifasciatus, Epinephelus 452
latifrons, Citharichthys 984
latifrons, Syacium 984
latimaculatus, Ophisurus 150
latirostris, Aëtobatus 89
latus, Caranx 354,356
latus, Scomber 369
Laurida 215
leachianus, Thynnus 311
lebranchus, Mugil 275
leei, Symphurus 1007
lefroyi, Diapterus 588
lefroyi, Gerres 587
lefroyi, Ulæma 588
Lefroyia 963
leiarchus, Cynoscion 659
leiarchus, Otolithus 659
leionothos, Holocanthus 812,817
lemniscatus, Engraulis 204
lemniscatus, Osmerus 222
lentiginosa, Muræna 169
lentiginosus, Galeichthys 111
lentiginosus, Tachisurus 111
leopardinus, Antennarius 1014
Lepidomegas 394
Lepimphis 405
Lepisoma 935
Lepophidium 960
Leptecheneis 896
Leptocardii 27
Leptocephalidæ 135
Leptocephalus 137
Leptofierasfer 964
Lepturus 328
lepturus, Caranx 354
lepturus, Trichiurus 328
Les spheroides 811
lethopristis, Orthopristis 544
leucas, Carcharias 43
leuciscus, Pomadasys 551
leuciscus, Pristipoma 551
leucopus, Rhamphoberyx 295
leucorhynchus, Rhinobatus 68
leucurus, Caranx 344
leucurus, Hemicaranx 344
leucurus, Nauclerus 400
liberiensis, Balistes 793
libertate, Opisthonema 188
libertatis, Meletta 188
lignus, Hypsoblennius 946
ligulata, Bibronia 1004
Limamuræna 168
limbatus, Carcharhinus 41
limbatus, Carcharias 41
limbatus, Oxyodontichthys 159
limbatus, Saurus 222
linea, Mesoprion 510
linearis, Porobronchus 963
lineata, Coryphæna 729
lineata, Echeneis 895
lineata, Unibranchapertura 131
lineatus, Achirus 994,998
lineatus, Calliodon 735,741
lineatus, Diapterus 602
lineatus, Doryichthys 261
lineatus, Doryrhamphus 261
lineatus, Eques 677
lineatus, Gerres 599
lineatus, Microgogon 616
lineatus, Mugil 275
lineatus, Phtheirichthys 895

lineatus, Pleuronectes 998
Lophogobius 866
Loro 744
loro, Scarus 739
loubina, Perca 425
loxias, Prionotus 855
lucasanum, Thalassoma 727
lucasanus, Julis 727
lucida, Anchovia 205
lucidus, Stolephorus 205
lucretiæ, Aboma 887
lucretiæ, Gobius 887
lugubris, Caranx 352
lumbricus, Muræna 131
luna, Caranx 349
lunaris, Tetraodon 809
lunata, Echeneis 896
lunulatus, Galeorhinus 33
lunulatus, Mustelus 33
lunulatus, Serranus 461
lutescens, Chetodon 773
luteum, Hæmulon 534
Lutianidæ 490
Lutianus 493
lutianus, Lutianus 493
Lycengraulis 211
lychnus, Myripristis 294
Lycodontis 162
lyricus, Gobionellus 880
lyricus, Gobius 880
Lythrulon 528

macgregori, Halichœres 722
mackayi, Siphostoma 257
mackayi, Syngnathus 257
Mackerels 307
Mackerel Sharks 63
maclura, Raja 87
macracanthus, Pomadasys 552
macracanthus, Priacanthus 487
macrocephala, Clupea 178
macrocephalus, Clinus 933
macrocephalus, Gonocephalus 860
macrocephalus, Mnierpes 933
macrocerus, Monacanthus 800
Macrodon 646
macrolepidota, Anchovia 210
macrolepidota, Engraulis 210
macrolepidotus, Engraulis 196
macrophthalma, Clupea 184
macrophthalmus, Sardinella 184
macropoma, Centropristis 475
macropoma, Diplectrum 475
macrops, Calamus 575
macrops, Corvina 691
macrops, Corvula 691
macrops, Hippoglossina 973
macrops, Opisthopterus 193
macrops, Pristigaster 193
macropterus, Balistes 795
macropterus, Thynnus 316
macropthalmus, Scomber 309
macrostomum, Hæmulon 535
macrourus, Alopias 62
macrurus, Leptofierasfer 964
macrurus, Oxyodontichthys 154,159
maculata, Belone 231
maculata, Perca 456
maculatus, Apogon 415
maculatus, Balistes 794,795
maculatus, Canthidermis 795
maculatus, Cogrus 153
maculatus, Galeus 56
maculatus, Monoprion 414
maculatus, Mullus 303
maculatus, Ostracion 807
maculatus, Rhypticus 482
maculatus, Scomber 309,324
maculatus, Scomberomorus 324
maculatus, Upeneus 303
maculatus, var. a, Diodon 830
maculicauda, Orthostœchus 525,526
maculiferus, Platophrys 977
maculipinnis, Isogomphodon 41
maculipinnis, Monochir 998
maculipinnis, Monochirus 994
maculo-cinctus, Sarothrodus 771
maculosa, Harengula 184
maculosa, Thalassophryne 919
maculosum, Hæmulon 543
maculosus, Epinephelus 461
maculosus, Nomeus 408
maculosus, Pleuronectes 974
macutiferus, Pleuronectes 977
maderaspatensis, Priacanthichthys 452
magnioculis, Ophichthus 157
magnioculis, Scytalophis 157
mahogoni, Lutianus 504
mahogoni, Mesoprion 504
major, Gallichtys 363,364
malabarica, Elacate 404
Malacoctenus 938
malcoti, Carcharias 50
malleus, Zygæna 59
Malthe 1016
manatia, Raia 94
manglicola, Gobionellus 883
manglicola, Gobius 883
mango, Polynemus 289
Manta 94
Mapo 867
mapo, Gobius 867
maracanthum, Pristipoma 552
Marcgravia 918
Marcgravicthys 918
marcgravii, Aulastome 250
marcgravii, Coryphæna 406
marcgravii, Rhinobatus 69
margaritatus, Batrachus 923
margaritatus, Porichthys 923
margaritifer, Serranus 458
margaritiferum, Hæmulon 528
marginalis, Epinephelus 452

marginalis, Hippocampus 255
marginatus, Bodianus 446
marginatus, Carangus 356
marginatus, Caranx 339,356
marginatus, Chætodon 701
marginatus, Chromis 695
marginatus, Heliasis 695
marginatus, Hemirhamphus 234
marina, Vulpecula 62
marinus, Dasybatus 75
marinus, Mugilops 272
marinus, Silurus 96,99
marmoratus, Gobiesox 926
marmoratus, Sphœroides 813
marmoratus, Synbranchus 131
marmoratus, Tetrodon 813
marmoratus, Tirus 215
martinicensis, Menticirrhus 670
martinicensis, Umbrina 670
martinicensis, Vomer 366
martinicus, Upeneus 306
massachusettensis, Monocanthus 798
matejuelo, Amphiprion 297
mathematicus, Tetrodon 811
matoides, Acanthurus 784
mauriceii, Argyriosus 373
mauritii, Chætodon 701
mauritii, Eleotris 408
mauritii, Grammistes 569
maxillosus, Opisthognathus 900
maximus, Lachnolaimus 709
mazatlana, Seriola 395
mazatlanum, Hæmulon 526
mazatlanus, Achirus 1000
mazatlanus, Solea 1000
mcclellandi, Bregmaceros 969
mediterraneus, Scomber 319
mediterraneus, Thynnus 314
medius, Centropomus 421
medius, Peprilus 413
medius, Stromateus 413
medusicola, Caranx 355
meeki, Eucinostomus 587
megacephalus, Calamus 572,575
Megaderus 170
megalepis, Doratonotus 730,731
megalodon, Pristis 66
megalops, Thalassophryne 921
Megaphalus 925
melampygus, Caranx 353
melanochira, Belone 226
melanopoma, Polynemus 292
melanopsis, Diodon 830
melanopterum, Pristipoma 566
melanopterus, Balistes 795
melanopus, Arius 124,127
melanothos, Holocanthus 811
melanura, Perca 523,536
melanurum, Hæmulon 536
melanurus, Lutjanus 516
Menephorus 438
Menidia 266
menidia, Argentina 204
menidia, Atherina 266
menisorrah, Carcharias 36
menisorrah, Carcharinus 48
Menticirrhus 666
mento, Exocœtus 244
merus, Centopristis 462
Mesoprion 493
metallica, Echeneis 896
mexicanus, Amblyopus 894
mexicanus, Centropomus 423
mexicanus, Diapterus 599
mexicanus, Gerres 599
mexicanus, Mugil 275
mexicanus, Saurus 221
miarcha, Anchovia 199
miarchus, Stolephorus 199
Microdesmus 954
microdon, Gobionellus 879
microdon, Gobius 879
microdon, Pristis 66
Microdonophis 153
Microgobius 871
microphthalmum, Hæmulon 540
Micropogon 616
microps, Carcharias 41
microps, Nebris 680
microps, Otolithus 657
microps, Pagellus 572
microps, Rhypticus 480
Micropteryx 394
micropteryx, Platysomus 366
microrrhinos, Pseudoscarus 744
Microspathodon 705
microstomus, Conger 139
microstomus, Etropus 992
micrura, Pteroplatea 87
micrura, Raia 87
micrurum, Syacium 980,981
milberti, Carcharhinus 38
milberti, Carcharias 38
milneri, Pagellus 573
mindii, Stellifer 626
mindii, Syngnathus 261
minuta, Arbaciosa 928
minutus, Evorthodus 870
minutus, Hypsoblennius 943
minutus, Sabastes 845
miraflorensis, Microgobius 873
mirum, Calloptilum 969
mitchilli, Argyreiosus 373
Mnierpes 933
Mobula 93
Mobulidæ 92
Moharra 591
Mojarras 581
molestum, Gobiosoma 891
mollis, Pleuronectes 994,1002
moluccensis, Apogon 414
Monacanthidæ 796
Monacanthus 796
monacanthus, Plectropoma 464

monoceros, Balistes 801
Monochirus 994
monophthalmus, Auchenopterus. 932
Monoprion 414
Monosira 683
Morays 160
mordax, Macrodon 648
mordax, Sagenichthys 648
moribundus, Balistes 793
moringa, Gymnothorax 166
moringa, Muræna 166
morio, Epinephelus 455
morio, Serranus 455
morrhua, Serranus 452
morrisi, Leptocephalus 137
motta, Elacate 403,404
moucharra, Glyphisodon 700,701
mucronatus, Neoconger 144
mucronatus, Odontognathus 193
muelleri, Lepidomegas 394
Mugil 273
Mugilidæ 273
Mugilomorus 175
Mugilops 271
mülleri, Carcharias 41
Mullets 273
Mullidæ 302
multiguttatum, Plectropoma 464
multiguttatus, Alphestes 464
multilineatum, Hæmulon 534
multimaculatus, Diodon 830
multiradiatus, Arius 123
multiradiatus, Microdesmus 958
mundeola, Anchovia 208
mundeola, Stolephorus 208
mundus, Dactylagnus 904
mundus, Oligoplites 389
mundus, Urolophus 83
mundus, Urotrygon 82,83
Muræna 168
muræna, Gymnothorax 161
Murænesocidæ 141
Murænesox 141
Murænidæ 160
Murænophis 168
muricatus, Odontognathus 193
mustelus, Squalus 34
Mycteroperca 444
Myliobatidæ 88
Myliobatis 90
myops, Salmo 222
myops, Saurus 222
myops, Trachinocephalus 222
myriaster, Rhomboidichthys 977
Myrichthys 149
Myridæ 145
Myripristis 293
Myrophis 145
mystacinus, Epinephelus 455
mystacinus, Serranus 452,455
mystes, Scorpæna 836
mysticetus, Cetengraulis 212
mysticetus, Engraulis 212

nalnal, Sparactodon 402
Narcaciontidæ 72
Narcine 72
narinari, Aëtobatus 89
narinari, Raja 88,89
naso, Anchovia 201
naso, Stolephorus 201
nasus, Menticirrhus 668
nasus, Umbrina 668
nasuta, Netuma 112
nasutus, Monacanthus 800
nasutus, Trachynotus 383
natalensis, Mustelus 34
natator, Carcharhinus 40
Nauclerus 399
Naucrates 399
naucrates, Echeneis 896
naufragium, Balistes 790
Nautopædium 922
nautopædium, Porichthys 923
Nebris 680
nebularis, Platophrys 979
nebulifer, Labrax 466
nebulopunctatus, Gobius 867
nebulosus, Aphoristia 1004
nebulosus, Apionichthys 1003
Needlefishes 223
Nematistiidæ 329
Nematistius 329
Nematognathi 95
neoboracensis, Fistularia 250
Neoconger 144
Neomænis 493
nesiotes, Carcharias 44
Netuma 112
Nexilarius 704
nicaraguensis, Eulamia 38
nicholsi, Halichœres 724
nicholsi, Platyglossus 724
niger, Scomber 403
niger, Zeus 372
nigra, Emblemaria 953
nigra, Narcine 73
nigrescens, Centropomus 426
nigrescens, Dorsuarius 605
nigrescens, Scarus 743
nigrescens, Symphurus 1004
nigricans, Acanthurus 785
nigricans, Cypselurus 247
nigricans, Exocœtus 247
nigriculus, Acronurus 783
nigriculus, Serranus 457
nigripinnis, Rhypticus 482
nigripinnis, Rypticus 482
nigrirostris, Chætodon 769
nigrirostris, Sarothrodus 769
nigritus, Epinephelus 462
nigritus, Serranus 462
niphonius, Priacanthus 489
nitens, Ariosoma 140

nitens, Ophisoma 140
nitidum, Pristipoma 551
niveatus, Epinephelus 458
niveatus, Serranus 452,458
nivepes, Emblemaria 952
nobilis, Conodon 521
nobilis, Perca 521
nocturna, Echidna 171
nocturnus, Pœcilophis 171
Nomeus 407
notata, Atherina 266
notata, Megalops 187
notatus, Porichthys 922,923
notospilus, Pseudojulis 723,725
Novacula 729
novacula, Coryphæna 729
noveboracensis, Naucrates 400
nove-boracensis, Vomer 366
novemfasciatus, Lutianus 497
novemmaculatus, Diodon 830
noyesi, Scarus 738
nuchalis, Ælurichthys 97
nuchalis, Scarus 740
nuchifilis, Blennius 941
nuchipinnis, Clinus 936
nuchipinnis, Labrisomus 936
nudus, Gerhardinus 889
Nurse Sharks 29
nuttalli, Exocœtus 245

oblongus, Gobius 894
obscurus, Carcharhinus 46
obscurus, Squalus 46
obtusum, Hæmulon 566
obtusus, Galeocerdo 56
obtusus, Scarus 740
obvelatus, Prionodon 46
occidentalis, Chorinemus 390
occidentalis, Monacanthus 799
occidentalis, Myripristis 295
occidentalis, Nebris 681
occidentalis, Oligoplites 387
oceanicus, Gobionellus 877
oceanicus, Gobius 877
ocellaris, Blennius 940
ocellaris, Platessa 974
ocellata, Murænophis 156
ocellatus, Chætodon 771
ocellatus, Gymnothorax 168
ocellatus, Hippoglossus 981
ocellatus, Ophichthus 156
ocellatus, Platophrys 979
ocellatus, Pleuronectes 977
ocellatus, Rhombus 979
oculatus, Balistes 794,795
oculatus, Myrichthys 150
oculatus, Pisoodonophis 150
Ocyurus 515
ocyurus, Sectator 609
ocyurus, Pimelepterus 609
Odontognathus 193
Odontoscion 688
œrstedii, Selene 375
Ogcocephalidæ 1016
Ogcocephalus 1016
Ogilbia 965
oglina, Megalops 186,187
oglinum, Opisthonema 187
Ognichodes 894
ojanco, Mesoprion 504
olfax, Serranus 444
oligodon, Polynemus 290
Oligoplites 387
olisthostoma, Gerres 595
olisthostomus, Diapterus 595
ommata, Discopyge 74
ommata, Opisthognathus 900
omostigma, Genypterus 961
opalescens, Lythrulon 528
opalina, Julis 717
opercularis, Polynemus 292
opercularis, Stolephorus 213
opercularis, Trichidion 292
Ophichthus 153
Ophichthyidæ 147
Ophichthys 154
Ophidiidæ 959
Ophioscion 636
ophioscion, Corvina 641
ophis, Muræna 153
Ophisternon 131
Opisthognathidæ 899
Opisthognathus 900
Opisthonema 186
opisthophthalmus, Conger 139
Opisthopterus 191
Opistognathus 900
oppositus, Monacanthus 798
Opsanus 917
orbicularis, Diodon 831
Orbidus 811
orbignyana, Pellona 189
orbitarius, Pagellus 475
ordinatus, Epinephelus 459
Orectolobidæ 29
orientalis, Pelamys 318
ornatissimus, Chætodon 765
ornatissimus, Herpetoichthys 153
ornatus, Achirus 1004,1005
ornatus, Balistes 803
ornatus, Micropogon 675
Ornichthys 848
orqueta, Chloroscombrus 370
ørstedii, Selene 375
Orthopristis 544
Orthostœchus 525
Orycnus 314,315
osbeck, Trachinus 457
Osbeckia 801
oscitans, Sciæna 621
oscitans, Stellifer 621
oscula, Netuma 120
osculus, Arius 120
osseus, Tholichthys 766

Ostorhinchus 414
Ostraciidæ 804
othonopterus, Cynoscion 654
Otophidium 961
otrynter, Caranx 362
ouatalibi, Serranus 438,439
ovale, Syacium 982
ovalis, Hemirhombus 982
ovatus, Trachynotus 379
oviceps, Ostracion 806
Ovoides 823
Oxybeles 963
oxybrachius, Scarus 748
Oxyodontichthys 154
oxyptera, Corvina 437
oxyrhynchus, Carcharias 36
oxyrhynchus, Tetrodon 825
oxyurus, Nomeus 408

pachycephalus, Lagocephalus 810
pachycephalus, Tetrodon 810
pachylepis, Atherinichthys 269
pachylepis, Kirtlandia 269
pachylepis, Thyrina 266
Pachynathus 787
pacifica, Belone 227
pacifici, Anisotremus 564
pacifici, Batrachoides 912
pacifici, Batrachus 912
pacifici, Conodon 564
pacificum, Diplectrum 477
pacificus, Argyreiosus 374
pacificus, Larimus 687
pacificus, Lobotes 484
pacificus, Mesoprion 497
pacificus, Psenes 409
pacificus, Thynnus 316
pacificus, Tylosurus 227
pætulus, Hemirhombus 980,983
Pagrus 576
pagrus, Pagrus 576
pagrus, Sparus 576
pallida, Echeneis 899
paloma, Trachinotus 386
Palometa 410
palometa, Palometa 410
palometa, Peprilus 412
palometa, Stromateus 412
pampanus, Trachinotus 377,385
panamense, Pristipoma 554
panamensis, Ælurichthys 97
panamensis, Anchovia 207
panamensis, Atherinella 265
panamensis, Azevia 990
panamensis, Bascanichthys 151
panamensis, Caranx 361
panamensis, Citharichthys 990
panamensis, Engraulis 207
panamensis, Euctenogobius 874
panamensis, Evermannia 893
panamensis, Felichthys 97
panamensis, Menticirrhus 669
panamensis, Muræna 161
panamensis, Odontognathus 194
panamensis, Parapsettus 763,764
panamensis, Pellona 189
panamensis, Petrometopon 443
panamensis, Pomadasys 554
panamensis, Pristigaster 194
panamensis, Rabula 161
panamensis, Serranus 443
panamensis, Solea 996
panamensis, Umbrina 669
pannosa, Scorpæna 839
Papagallos 329
papillosum, Syacium 983
papillosus, Pleuronectes 983
Paradiodon 826
paradiseus, Polynemus 289
paradoxa, Garmannia 890
paradoxus, Gobius 889
Paralabrax 66
Paralichthys 974
parallelus, Centropomus 423
Paralonchurus 671
Paranthias 436
Parapomacentrus 697
Parapsettus 763
Paratractus 346
pardalis, Monacanthus 800
pardalis, Ophichthys 150
Pareques 676
Parexocœtus 244
parezii, Platypodon 47
pargus, Mesoprion 499
parra, Diabasis 539
parra, Hæmulon 539
parræ, Albula 178
parraianus, Monacanthus 800
Parrot-fishes 732
paru, Chætodon 775
paru, Peprilus 411
paru, Pomacanthus 773,775
paru, Stromateus 411
Parupeneus 303
parva, Anchovia 202
parva, Echeneis 898
parvipinnis, Ancylodon 650
parvipinnis, Isopisthus 650
passer, Holacanthus 778
pastinaca, Raia 76
patao, Gerres 600
patatus, Julis 717
pavo, Chætodon 697
Pear-fishes 962
pectinatus, Centropomus 421
pectinatus, Pristis 66
pectinifer, Clinus 935,936
pectoralis, Harpe 712
pectoralis, Nematistius 329,330
Pediculati 1009
pedimacula, Centropomus 421
pelagicus, Callionymus 860
pelagicus, Scomber 405,406

pelagicus, Syngnathus 256
pelamides, Scomber 310
pelamis, Gymnosarda 310
pelamis, Scomber 310
pelamitus, Scomber 319
Pelamys 317
pelamys, Scomber 319
pelamys, Thynnus 310
Pellona 189
Peloria 977
penna, Calamus 572
penna, Pagellus 572
pensacolæ, Harengula 184
pentacanthus, Bodianus 297
pepo, Scarus 736
Peprilus 410
percellens, Raja 69
percellens, Rhinobatus 69
periche, Diapterus 603
periche, Gerres 603
perottzti, Pristis 66
perrico, Pseudoscarus 745
perrico, Scarus 745
perspicillaris, Tetraodon 823
peruvianus, Diapterus 597
peruvianus, Galeichthys 105
peruvianus, Gerres 597
petersi, Paralonchurus 671
petersi, Paralonchus 676
petimba, Fistularia 251,252
Petrometopon 441
petrosus, Mugil 279
petus, Cybium 327
phlebotomus, Acanthurus 785
phoxocephalus, Cynoscion 660
Phtheirichthys 895
Physogaster 809
picturata, Alutera 803
picturata, Seriola 338
picturatus, Gymnothorax 166
picturatus, Trachurus 338
pictus, Sciades 103
pictus, Torpedo 73
picuda, Sphyræna 283,284
picudilla, Sphyræna 287
piersoni, Hypsoblennius 945
pigmentarius, Apogon 418
pigmentarius, Monoprion 418
pilicornis, Blennius 941
pilosa, Solea 1000
Pimelepterus 605
pinima, Pristipoma acara 569
pinnimaculatus, Ælurichthys 100
pinnimaculatus, Felichthys 100
pinnulata, Seriola 393
pinta, Muræna 169
pintita, Muræna 165
Pipe-fishes 254
piquitinga, Engraulis 204
piraaca, Monacanthus 799
pirapeda, Dactylopterus 859,860
Pisodonophis 147
pisquetos, Caranx 358
pisquetus, Caranx 346
pixanga, Serranus 457
Plagiusa 1004
Plagusia 1004
plagusia, Pleuronectes 1004,1005
plagusia, Symphurus 1005
planiceps, Arius 117
planiceps, Netuma 117
Platophrys 977
platophrys, Citharichthys 986
Platygaster 189
Platypodon 36
platypogon, Arius 113
platypogon, Netuma 113
platyrhynchus, Eulamia 43
Plecopodus 894
plectrodon, Porichthys 922
Plectrypops 301
pleii, Hemirhamphus 234
Pleuracromylon 31
Pleuronectidæ 970
plumbeus, Carcharias 38
plumieri, Diapterus 598
plumieri, Gerres 598,600
plumieri, Mugil 275
plumieri, Sciæna 521
plumieri, Scomber 335
plumieri, Scomberomorus 321,323
plumieri, Scorpæna 835
plumieri, Tetrodon 815
plumierianus, Caranxomorous 337
plumierii, Chætodipterus 760,761
plumierii, Hæmulon 532
plumierii, Labrus 532
plumierii, Polydactylus 289
pneumatophorus, Scomber 309
Pœcilocephalus 153
Pœcilophis 170
pœcilopus, Myripristis 296
pœcilopus, Rhamphoberyx 293,296
poeyi, Engraulis 211
poeyi, Halichœres 720
poeyi, Hemirhamphus 237
poeyi, Lycengraulis 211
Polipturus 321
politus, Tetraodon 816
poloosoo, Caranx 361
Polycirrhus 671
Polyclemus 671
Polydactylus 289
polygonius, Acanthostracion 807
polylepis, Balistes 790
polylepis, Scorpæna 845
polynema, Parapomacentrus 697
Polynemidæ 288
Polynemus 289
polyspilos, Rhombus 971
Pomacanthodes 772
Pomacanthus 772
Pomacentridæ 693
Pomacentrus 697

Pomadasys 547
Pomataprion 705
Pomatomidæ 401
Pomatomus 402
Pompilus 399
pompilus, Thynnus 400
pondiceriana, Elacate 404
Porcupine Fishes 826
porcus, Scorpæna 833
Porgies 571
Porichthys 922
Porobronchus 963
porosissimus, Batrachus 922
porosissimus, Porichthys 922
porosus, Carcharhinus 49
porosus, Carcharias 49
postica, Echeneis 898
powellii, Balistes 793
prædatorius, Cestreus 658
prædatorius, Cynoscion 658
prayensis, Upeneus 303
Priacanthichthys 452
Priacanthidæ 486
Priacanthus 487
prieto, Lutjanus 497
principis, Antennarius 1015
principis, Chironectes 1015
principis, Julis 717
Prionodes 470
Prionodon 36
Prionotus 848
Pristidæ 65
Pristis 65
pristis, Squalus 65
Pristocantharus 544
Pristotis 697
probatocephalus, Sparus 577
proboscideum, Monacanthum 803
proboscideus, Chænomugil 281
proboscideus, Mugil 281
producta, Anchovia 210
productum, Pristipoma 559
productus, Engraulis 210
productus, Eucinostomus 588
profundorum, Leptophidium 960
Promicrops 450
prorates, Lepophidium 960
prorigera, Ariosoma 140
prorigerum, Ophisoma 140
prospinosum, Holocentrum 301
Prospinus 463
proxima, Seriola 397
Psenes 409
Pseudobythites 968
pseudogula, Eucinostomus 584
pseudogula, Gerres 584
pseudo-hispanica, Sardinia 180
pseudohispanicus, Clupanodon 180
Pseudojulis 725
Pseudopriacanthus 489
Pseudorhombus 971
Pseudoscarus 744
Pseudupeneus 303
psittacinus, Serranus 470
psittaculus, Labrus 717
psittacus, Coryphæna 729
psittacus, Scarus 735
psittacus, Xyrichthys 729
Pteromylæus 91
Pterophryne 1010
Pterophrynoides 1010
Pteroplatea 86
puella, Plectropoma 467
Puffers 808
pulcherrimus, Balistes 787
pullus, Cantherines 800
pullus, Monacanthus 800
puncta, Furcaria 694
punctata, Alutera 802
punctata, Gorgasia 133
punctata, Muræna 166
punctata, Opisthognathus 901
punctata, Perca 438
punctata, Trigla 848,850
punctatissimus, Canthigaster 825
punctatissimus, Ophioscion 644
punctatissimus, Tetrodon 825
punctatus, Balistes 793
punctatus, Caranx 334
punctatus, Decapterus 334
punctatus, Diodon 827
punctatus, Monacanthus 800
punctatus, Myrophis 145,146
punctatus, Prionotus 850
punctatus, Prionurus 786
punctatus, Squalus 29,55
punctatus, Trachinus 456
punctatus, Upeneus 304
puncticeps, Cryptopterus 154,160
puncticeps, Ophichthus 160
puncticulatus, Chilomycterus 832
punctipinnis, Ayresia 695
punctulata, Perca 438
punctulatus, Hippocampus 255
punctulatus, Scarus 737
punctulatus, Squalus 29
purpureus, Labrus 726
pyrrhovinctum, Thalassoma 728

quadrangularis, Selene 761
quadratus, Zeus 761
quadricorne, Ostracium 808
quadricornis, Ostracion 805,807
quadrigutta, Pomacentrus 705
quadrilineatum, Hæmulon 523,524
quadrimaculatus, Diodon 830
quadripennis, Salarias 951
quadripunctatus, Scomber 311
quadrispinosus, Scarus 739
quadrocellatus, Ancylopsetta 971
quaican, Echeneis 896
quatuordecimlaminatus, Echeneis 899
Querimana 273
querna, Azevia 991

querna, Cyclopsetta 991
quiebra, Lichia 390
quiescens, Prionotus 857
quinquecinctus, Pomacanthus 773
quinquefasciatus, Serranus 450
quinquelineatum, Hæmulon 524
quinquemaculata, Raia 89

Rabdophorus 765
Rabirubia 514
rabirubia, Anthias 515
Rabula 161
Rachycentridæ 403
Rachycentron 403
Rachycentrum 403
radiale, Diplectrum 775,477
radialis, Serranus 472,475
radians, Epinephelus 473
radians, Sparisoma 750
radians, Scarus 751
radiatus, Halichœres 717
radiatus, Labrus 714,717
Raizero 493
Raja 71
Rajidæ 70
rammelsbergii, Mugil 275
ramosum, Pristipoma 559
Ramularia 971
raphidoma, Belone 226
raphidoma, Tylosurus 226
rascacio, Scorpæna 835
rastralis, Anchovia 209
rastralis, Stolephorus 209
rathbuni, Paralonchurus 674
rathbuni, Polycirrhus 674
rayneri, Galeocerdo 56
rectifrænum, Pomacentrus 698
refulgens, Oligoplites 392
regalis, Otolithus 653
regalis, Scomber 321,323
regalis, Scomberomorus 323
remifer, Isopisthus 651
remiger, Ophisurus 156
Remora 897
remora, Echeneis 897,898
remora, Remora 898
Remoras 895
Remorina 897
Remoropsis 897
remotus, Carcharhinus 47
remotus, Carcharias 47
remotus, Serranus 455
reticularis, Anchisomus 817
reticulata, Hemistoma 736
reticulata, Thalassophryne 920
reticulatus, Cynoscion 661
reticulatus, Diodon 831
reticulatus, Otolithus 661
retropinnis, Microdesmus 955
retrospinis, Holocentrum 301
retrospinis, Plectrypops 301
Rhamphoberyx 293
Rhegma 478
Rhinesomus 804
Rhinobatidæ 67
Rhinobatos 67
Rhinobatus 67
rhinobatus, Raja 67
Rhinoscion 679
rhodopus, Trachinotus 383
rhodopus, Trachynotus 382,383
rhodospilus, Gobiesox 926
rhomaleum, Sparisoma 754
rhombeus, Diapterus 593
rhombeus, Gerres 591,592
rhomboides, Acanthinion 377,379
rhomboides, Chætodon 378
rhomboides, Hemicaranx 345
Rhomboidichthys 977
Rhomboplites 517
Rhombus 410
ricardi, Mesoprion 504
richardi, Caranx 354
richardi, Hemirhamphus 237
rijgersmæi, Ocyurus 516
rim, Scomber 361
rimator, Bathystoma 523
risso, Alpismaris 215
rivoliana, Seriola 396
robalito, Centropomus 430
Robalos 419
roberti, Hemirhamphus 237,239,240
roberti, Hyporhamphus 239
rocheanus, Thynnus 313
rochei, Scomber 312,313
Rock-fishes 833
rodo, Pristipoma 560,569
ronchus, Bairdiella 633,634
ronchus, Corvina 634
rondeletii, Carcharodon 63
rondeletii, Exonautes 245
rondeletii, Exocœtus 245
rosaceus, Mesoprion 501
roseus, Cryptotomus 733,734
rostrata, Albula 178
rostrata, Anguilla 134
rostrata, Muræna 134
rostratus, Gymnothorax 166
rostratus, Scarus 744
rostratus, Tetrodon 825
rostratus, Zeus 373
rotundatus, Balistes 794
rotundatus, Canthidermis 794
rousseau, Syngnathus 258
ruber, Apogon 414
ruber, Bodianus 507
ruber, Bodianus fulvus 439
ruber, Caranx 357
ruber, Coregonus 220
ruber, Epinephelus 445
ruber, Mycteroperca 445
ruber, Scomber 357
rubigenes, Batrachus 918
rubropunctatus, Salarias 951

Rudder-fishes 604
rufipinnis, Exocœtus 245
rufipinnis, Exonautes 245
rufus, Balistes 795
rufus, Bodianus 711
rufus, Labrus 711
rugifer, Ophichthus 156
rupestris, Serranus 446
Rupiscartes 948
ruppelii, Monacanthus 800
ruscarius, Prionotus 850
russula, Scorpæna 843
Rypticus 479

sabanensis, Hippoglossina 972
sabina, Trygon 77
sabinus, Dasybatus 77
Sagenichthys 646
sagitta, Amblyopus 869
sagitta, Tylosurus 229
sagittula, Euctenogobius 879
sagittula, Gobionellus 879
Salarias 951
Salarichthys 949
Salema 577
saliens, Oligoplites 390
saliens, Scomber 390
salmoneus, Esox 220
saltans, Chorinemus 390
saltator, Hemirhamphus 235
saltator, Scomberoides 390
saltator, Temnodon 402
saltatrix, Perca 402,608
saltatrix, Pomatomus 402
sanctæ crucis, Pseudoscarus 741
sanctæ-luciæ, Corvula 692
sanctæ-marthæ, Vomer 366
sanctæ-petri, Vomer 366
sancti-laurentii, Engyophrys 975,976
Sand Star-gazers 902
sanguineus, Antennarius 1013
sanguineus, Pseudobythites 968
sanguineus, Sicyases 926
saponaceus, Anthias 479,480
saponaceus, Rypticus 480
Sarda 317
sarda, Sarda 319
sarda, Scomber 317,319
sardina, Harengula 183
sardina, Sardinella 183
Sardinella 181
Sardinia 180
sargoides, Chætodon 701
Sargus 580
sargus, Sparus 580
Sarothrodus 765
sarra, Cybium 326,327
saturnus, Amblodon 679
Saurus 215
saurus, Elops 175,176
saurus, Oligoplites 390
saurus, Salmo 215
saurus, Scomber 387,390
saurus, **Trachurus** 336
savanna, Muræna 143
savanna, Murænesox 143
Sawfishes 65
saxatilis, Abudefduf 701
saxatilis, Chætodon 700,701
say, Dasybatus 77
say, Raja 77
scaber, Antennarius 1012
scaber, Centropomus 433
scaber, Chironectes 1012
scabra, Trinectes 1002
scapularis, Orthopristis 545
scapularis, Tylosurus 230
scapus, Balistes 797
Scaridæ 732
Scartes 951
Scartichthys 951
Scarus 735
Schistorus 452
schlegelii, Orcynus 315
schmardæ, Dasybatus 81
schmardæ, Trygon 81
schmidtii, Hoplunnis 143
schœpfii, Alutera 802
schœpfii, Balistes 802
schranki, Hæmulon 536,538
Sciadeichthys 103
Sciæna 679
Sciænidæ 610
sciera, Sciæna 642
scituliceps, Synodus 221
sciurus, Hæmulon 533
sciurus, Sparus 529,533
Scoliodon 51
Scomber 308
Scomberomorus 321
Scombridæ 307
scombrus, Scomber 308
scops, Gnathypops 900
scops, Opisthognathus 900
Scorpæna 833
Scorpænidæ 833
Scorpænodes 845
scripta, Alutera 803
scriptus, Balistes 801,803
scudderii, Hæmulon 542
scutatus, Ælurichthys 97
scutum, Achirus, 995
scutum, Solea 995
Scyris 363
Sea Basses 434
Sea Devils 92
Sebastopsis 845
Sectator 609
sectatrix, Kyphosus 608
secundo-dorsalis, Thynnus 315
seemanni, Arius 107
seemanni, Galeichthys 107
Selar 335
Selenaspis 101

Selene 371
sellicauda, Epinephelus 459
sellifer, Halichœres 722
semicinctus, Julis 714
semifasciatus, Serranus 466
semiluna, Sparus 515
seminudus, Eleotris 863
seminudus, Enypnias 888
seminudus, Gobius 887,888
seminudus, Gymneleotris 863
semiruber, Labrus 711
semispinous, Caranx 337
senticosus, Balistes 794
Sergeant-fishes 403
Seriola 394
Seriolichthys 393
serra, Gonenion 402
Serranidæ 434
serrata, Fistularia 252
serratus, Naucrates 400
serrifer, Conodon 521
serrula, Priacanthus 490
serrula, Pseudopriacanthus 490
setapinnis, Vomer 366
setapinnis, Zeus 366
setifer, Argyriosus 373
setifer, Monacanthus 797,798
setipinnis, Argyreiosus 366,367
setipinnis, Vomer 366,367
setosus, Mugil 280
sexcornutus, Ostracion 807
sex-decim lamellata, Echeneis 899
sexfasciatum, Hæmulon 543
sexmaculatus, Diodon 830
sicana, Cerna 462
sicula, Pimelepterus bosci var. 608
Sicyases 926
Sicyogaster 926
sierita, Tylosurus 228
sierra, Scomberomorus 324
Sigmurus 636
signatus, Microgobius 871
signifer, Chatœssus 187
Siluridæ 95
Silversides 262
similis, Hæmulon 534
simillimus, Gerres 589
simondsi, Galeichthys 108
simulus, Ophioscion 637
simus, Menticirrhus 668
sinaloæ, Paralichthys 974
Siphostoma 256
Skates 70
skib, Pomatomus 402
sloanei, Scomber 315
sloani, Leiobatus 85
smaragdus, Eleotris 864,865
smaragdus, Erotelis 865
smaragdus, Gobionellus 882
smaragdus, Gobius 882
Smecticus 479
Snappers 490
snyderi, Hemirhamphus 240
snyderi, Hyporhamphus 240
snyderi, Peprilus 413
sobra, Mesoprion 501
sogo, Holocentrus 296
sohal, Chætodon 781
sohar, Chætodon 781
solandri, Acanthocybium 326
solandri, Cybium 326
solea, Caranx 349
soleæformis, Rhombus 983
Soleidæ 993
Soleotalpa 1003
Soles 993
somnolentus, Lobotes 485
sonnerati, Opistognathus 900
soporator, Bathygobius 867
soporator, Gobius 867
sordidus, Chætodon 700
Spade-fishes 760
spadiceus, Centrurophis 153
Sparactodon 402
Sparidæ 571
Sparisoma 747
speciosus, Gnathanodon 361
speciosus, Scomber 360,361
spectrum, Lophius 1012
spengleri, Sphœroides 815
spengleri, Tetrodon 811,812,815
spet, Sphyræna 287
Spheroides 811
Sphœroides 811
Sphyræna 283
sphyræna, Esox 283
sphyrænarum, Echeneis 895
Sphyrænidæ 282
Sphyrna 57
spilopterus, Citharichthys 987,988
spilotopterygius, Balistes 793
spinarella, Gasterosteus 859
spindens, Scarus 733
spinifer, Engraulis 207
spinifera, Anchovia 207
spinosissimus, Diodon 830
spinosus, Centronotus 404
spinosus, Chilomycterus 832
spinosus, Diodon 832
spinosus, Trachinotus 379
spixianus, Saurus 221
spixii, Argyreiosus 373
Squalidæ 64
squalidum, Sparisoma 755
squalidus, Scarus 755
squalipeta, Echeneis 898
Squalus 64
squamipinnis, Cynoscion 655,656
squamipinnis, Gerres 589
squamipinnis, Otolithus 656
squamosus, Trachurus 359
Squirrel-fishes 293
stahli, Monosira 686
Star-gazers 906

starksi, Menidia 267
starksi, Stolephorus 203
starri, Pomadasys 559
stearnsii, Scorpæna 837
steindachneri, Arius 127
steindachneri, Hæmulon 537
steindachneri, Tachysurus 127
stellatus, Caranx 353
stellatus, Tetraodon 809
Stellifer 619
stellifer, Bodianus 619
Stelliferus 619
stellio, Perca 456
Stephanolepis 797
stigmaticus, Gobionellus 882
stigmaticus, Smaragdus 882
Sting Rays 75
stipes, Atherina 264
stirurus, Chloroscombrus 370
stolifera, Clupea 182
stolifera, Sardinella 182
stolzmanni, Belone 228
stolzmanni, Cynoscion 663
stolzmanni, Otolithus 663
stolzmanni, Tylosurus 228
strabo, Ophioscion 640
stratus, Monacanthus 800
striata, Alausa 184
striata, Perca 524
striatum, Bathystoma 524
striatus, Anthias 450
striatus, Blennius 944
striatus, Bodianus 509
striatus. Chætodon 765,768
striatus, Epinephelus 460,473
striatus, Hypsoblennius 944
strigatus, Antennarius 1014
strigatus, Holacanthus 778
Stromateidæ 407
suareus, Caranx 334
subarcuatum, Hæmulon 532
suborbitale, Holocentrum 300
suborbitalis, Holocentrus 300
subtruncatus, Tylosurus 229,230
subulatus, Orcynus 316
succincta, Seriola 400
sucklii, Squalus 65
sueurii, Coryphæna 406
Sufflamen 787
sumichrasti, Cicharichthys 987
Surgeon-fishes 780
surinamensis, Anisotremus 566
surinamensis, Batrachus 911,915,916
surinamensis, Batrachoides 915,916
surinamensis, Holocentrus 484,485
surinamensis, Lobotes 484,485
surinamensis, Lutianus 566
Surmullets 302
sutor, Blepharis 364
Syacium 980
symmetricus, Caranx 338
Symphurus 1004
synagris, Lutianus 505
synagris, Sparus 505
Synbranchia 131
Synbranchidæ 131
Synbranchus 131
Synentognathi 223
Syngnathidæ 254
Syngnathus 256
Synodontidæ 215
Synodus 215
synodus, Esox 215

tabacaria, Fistularia 248,250
tabogensis, Microgobius 873
tæniatum, Hæmulon 527
tæniatus, Anisotremus 570
tæniopterus, Pseudoscarus 737
tang, Mugil 275
tapeinosoma, Auxis 313
Tarpon 173
Tarpons 173
tartoor, Pristigaster 191
tau, Batrachoides 911,914
tau, Gadus 917
Teleostomi 95
temmincki, Carcharias 36
Temnodon 402
templei, Pomadasys 559
tentabunda, Trigla 860
tenuifilis, Antennarius 1014
terræ-novæ, Scoliodon 55
terræ-novæ, Squalus 55
tessellata, Plagusia 1005
testudineus, Spheroides 819
testudineus, Sphœroides 817
testudineus, Tetraodon 811,817,822
tetracanthus, Sparus 511
Tetragonopterus 766
Tetraodon 822
Tetraodontidæ 808
tetraspilus, Upeneus 305
textilis, Salarais 949,950
textilis, Salarichthys 950
thalassina, Netuma 112
thalassinus, Doratonotus 731
Thalassoma 726
Thalassophryne 919
thaumasium, Rhegma 478
thazard, Auxis 313
thazard, Scomber 312,313
Tholichthys 766
thorbuni, Mugil 278
Threadfins 288
Thresher Sharks 62
Thrissa 180
thrissa, Clupanodon 186
thrissa, Clupea 180,187
thrissina, Clupea 185
thrissina, Sardinella 185
thrissoides, Megalops 174
thunnia, Thynnus 311
thunnina, Orcynus 311

Thunnus.......... 314
thynnoides, Auxis.......... 313
Thynnus.......... 314
thynnus, Scomber.......... 314
thynnus, Thunnus.......... 314
tibicen, Centropyge.......... 777
tiburo, Cestracion.......... 60
tiburo, Squalus.......... 60
tigrinus, Galeocerdo.......... 56
tigrinus, Myrichthys.......... 149
Tile-fishes.......... 796
timlei, Raja.......... 72
timucu, Esox.......... 229
timucu, Tylosurus.......... 229
Tirus.......... 215
Toad-fishes.......... 910
toeroe, Otolithus.......... 653
Tomicodon.......... 926
Trachinocephalus.......... 222
Trachinotus.......... 377
trachinus, Salmo.......... 222
Trachurops.......... 335
Trachurus.......... 336
trachurus, Caranx.......... 338
trachurus, Scomber..........336,337
trachurus, Trachurus.......... 337
tractus, Acanthurus.......... 783
transversalis, Synbranchus.......... 131
triacanthus, Argyriosus.......... 373
triacanthus, Nauclerus.......... 400
triangularis, Pachynathus.......... 787
Trichidion.......... 289
Trichiuridæ.......... 327
Trichiurus.......... 328
Trichoderma.......... 797
trichodon, Mugil.......... 276
Trichonotus.......... 175
tricolor, Chætodon..........777,779
tricolor, Engraulis.......... 204
tricolor, Holacanthus.......... 779
tricornis, Lactophrys.......... 807
tricornis, Ostracion.......... 807
Tricropterus.......... 346
tricuspidata, Murænesox.......... 141
tricuspidatus, Hyporhamphus 236,237
tridactylus, Blennius.......... 948
tridigitatus, Dactyloscopus...902,903
Trigger-fishes.......... 787
Triglidæ.......... 848
Trigonobatus.......... 76
trigonum, Ostracion.......... 806
trigonus, Ostracion..........804,806
trilobatus, Scarus.......... 740
Trinectes.......... 994
triourus, Bodianus.......... 485
Triple-tails.......... 483
triqueter, Lactophrys.......... 805
triqueter, Ostracion..........804,805
triserialis, Murænopsis.......... 155
triserialis, Ophichthus.......... 155
Trisotropis.......... 444
trispinosus, Scarus.......... 739
trivittatus, Grammistes.......... 524
tropica, Echeneis.......... 895
troschelii, Glyphidodon.......... 701
troschelii, Sciadeichthys.......... 103
troschelii, Sciades.......... 103
True Eels.......... 134
truncatus, Saurus.......... 222
Trunk-fishes.......... 804
Trygon.......... 76
tschudii, Discopyge.......... 74
tuberculata, Trygon.......... 78
tudes, Cestracion.......... 59
tudes, Zygæna.......... 59
turchesius, Scarus.......... 744
turgidus, Tetrodon.......... 815
tuyra, Arius.......... 128
tweedliei, Syngnathus.......... 259
Tylosurus.......... 224
Tyntlastes.......... 869
typicus, Ophioscion..........636,641
typus, Rachycentron.......... 403

ujo, Dasyatis.......... 76
Ulæma.......... 588
umbra, Sciæna.......... 679
Umbrina.......... 613
umbrosa, Narcine.......... 73
Umbrula.......... 666
undecimale, Hæmulon.......... 542
undecimalis, Centropomus...421,425
undecimalis, Sciæna..........419,425
undecim-radiatus, Centropomus. 425
undulata, Perca.......... 616
undulatus, Micropogon.......... 618
undulatus, Ostracion.......... 806
undulatus, Rhinobatus.......... 69
undulatus, Scomber.......... 309
undulosus, Serranus.......... 445
Unibranchapertura.......... 131
unicolor, Hypoplectrus.......... 469
unicolor, Perca.......... 469
unicolor, Soleotalpa.......... 1003
unicolor, Thynnus.......... 310
unifasciatus, Hyporhamphus.237,240
unimaculata, Perca..........577,578
unimaculatus, Archosargus.......... 578
unimaculatus, Argyreiosus.......... 366
uninotatus, Mesoprion.......... 506
unionensis, Centropomus.......... 428
Upeneus.......... 303
Upselonphorus.......... 907
Uranichthys.......... 154
Uranoscopidæ.......... 906
Urobatis.......... 85
Uropsetta.......... 974
Urotrygon.......... 82
ustus, Callyodon.......... 733
ustus, Cryptotomus.......... 733

vafer, Myrophis.......... 145
vagrans, Chirostoma.......... 268
vaigiensis, Gerres.......... 589

valenciennesi, Erotelis........864,865
valenciennesi, Smaragdus...... 882
vampyrus, Cephalopterus...... 94
variabilis, Pomacentrus........ 699
variegata, Echidna............ 170
varius, Monacanthus.......... 797
varius, Serranus.............. 457
velata, Chalisoma............. 792
velieana, Atherina............. 264
velox, Carcharhinus........... 45
velox, Sarda.................. 320
venenosa, Perca............... 444
venosus, Aluterus............. 803
ventralis, Brosmophycis........ 966
ventralis, Ogilbia.............. 966
venustus, Xyrichthys.......... 729
veræ-crucis, Bairdiella......... 634
verany, Cybium............... 327
vermicularis, Corvina.......636,645
vermicularis, Ophioscion....... 645
vermicularis, Sciæna........642,645
vermicularis, Sparus........... 505
vermiculatus, Xyrichthys...... 729
vermiformis, Neoconger........ 144
verres, Balistes............... 788
verres, Lutjanus.............. 711
verrilli, Gymnothorax......... 165
verrilli, Sidera................ 165
versicolor, Elapsopsis.......... 153
versipunctatus, Gymnothorax... 164
verticalis, Echeneis............ 869
vespertilio, Lophius.......1016,1017
vespertilio, Ogcocephalus...... 1017
vetula, Balistes.............787,792
vexillarius, Holocentrus........ 299
Vexillifer..................... 963
vicina, Murenophis........... 164
vicinus, Gymnothorax......... 164
vinctus, Caranx............... 358
viola, Eques.................. 678
virescens, Cynoscion.......... 657
virescens, Gallus............363,364
virescens, Otolithus........... 657
virgata, Coryphæna........... 406
virginicus, Anisotremus........ 569
virginicus, Polynemus......... 289
virginicus, Sparus...........560,569
viridis, Centropomus.......... 426
vittata, Echeneis.............. 896
vittatus, Sparus............... 569
vittatus, Synbranchus......... 131
vivanet, Bodianus............. 511
vivanus, Lutjanus............. 507
volitans, Cephalacanthus....... 860
volitans, Exocœtus............ 244
volitans, Trigla.............859,860
Vomer...................... 365
vomer, Selene..............372,374
vomer, Zeus................371,372
vomerinus, Salarias.........949,950
vulgaris, Anguilla............. 134
vulgaris, Auxis................ 313
vulgaris, Mustelus............ 34
vulgaris, Pagrus.............. 576
vulgaris, Thynnus............. 314
Vulpecula.................... 62
Vulpeculidæ.................. 62
vulpes, Albula................ 178
vulpes, Esox...............177,178
vulpes, Squalus............... 62
vulpinus, Squalus............. 62

waigensis, Gerres............. 591
woolmani, Paralichthys........ 974
Worm Eels................... 145
Wrasses..................... 709
wurdemanni, Gobius.......... 881

xanthops, Odontoscion......... 690
xanthopteron, Hæmulon....... 531
xanthopygus, Caranx.......... 350
xanti, Labrisomus............. 937
xanti, Labrosomus............ 937
xanti, Rhypticus.............. 481
xanti, Rypticus............... 481
xanti, Umbrina............... 615
xanti, Xenichthys............. 518
xenauchen, Galeichthys........ 111
Xenichthys................... 518
xenisma, Prionotus............ 854
xenops, Xenichthys........... 518
Xesurus..................... 786
Xyrichthys................... 729
xyris, Scorpænodes........... 845
xyris, Sebastopsis............ 845
Xystæma.................... 589
Xyster...................... 605
xystrodon, Sparisoma.......... 751

yalei, Ostracion.............. 806
y-græcum, Uranoscopus........ 907

Zalieutes...................1018
Zalypnus.................... 871
zebra, Arbaciosa.............. 927
zebra, Gerres................. 589
zebra, Gobiesox.............. 927
zelotes, Dactyloscopus......902,903
zelotes, Hemicaranx.......... 343
zephyreus, Astroscopus........ 907
zephyreus, Pristis............. 66
zestocarus, Stellifer.......... 620
zestus, Nebris................ 681
zonatus, Chætodipterus........ 762
zonatus, Ephippus............ 762
Zonichthys.................. 394
zonifer, Clinus............... 940
zonifer, Malacoctenus......... 940
zonipectus, Pomacanthodes 772,776
zonipectus, Pomacanthus...... 776
zophochir, Ophichthus......... 158
zosterura, Evermannia......... 892
zosterurum, Gobiosoma........ 891
zygæna, Cestracion............ 58
zygæna, Squalus..............57,58
zysron, Pristis................ 66

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